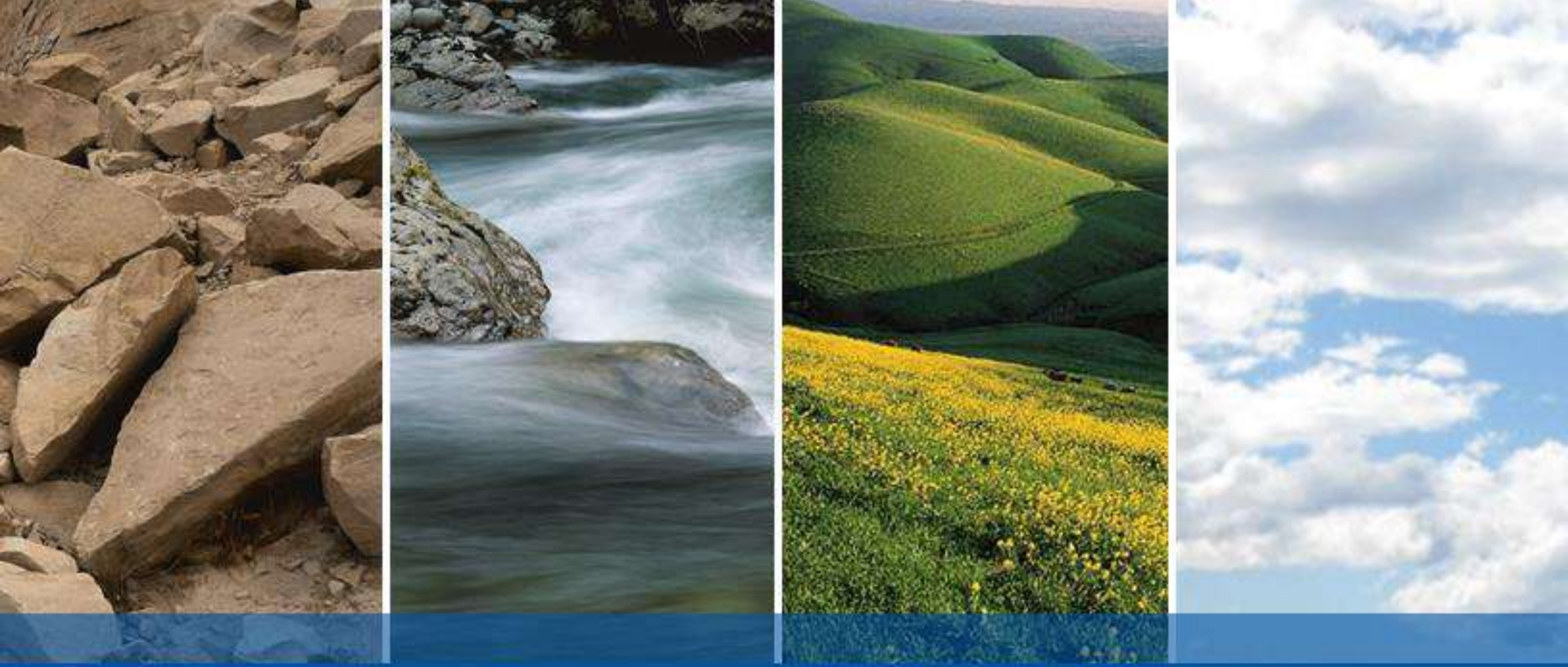
# APPENDIX E

# GEOTECHNICAL INVESTIGATION AND PEER REVIEW



# VALLEJO PROPERTIES – VISTA COVE
VALLEJO, CALIFORNIA

## PRELIMINARY GEOTECHNICAL EXPLORATION

SUBMITTED TO
Mr. Adam Smith
Sancerra
2618 San Miguel Drive, Suite 1223
Newport Beach, CA 92660

PREPARED BY
ENGEO Incorporated

September 12, 2022

PROJECT NO
20164.000.001



ENGEO
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Project No.
**20164.000.001**

September 12, 2022

Mr. Adam Smith
Sancerra
2618 San Miguel Drive, Suite 1223
Newport Beach, CA 92660

Subject: Vallejo Properties – Vista Cove
Wildflower Avenue
Vallejo, California

**PRELIMINARY GEOTECHNICAL EXPLORATION**

Dear Mr. Smith:

With your authorization, we have completed this preliminary geotechnical exploration for the proposed development of the Vallejo Properties – Vista Cove development located in Vallejo, California. The accompanying report presents the results of our site exploration and preliminary geotechnical conclusions and recommendations for the project.

Based on our initial assessment, the proposed residential development is feasible from a geotechnical standpoint. The main geotechnical and geologic concerns for the proposed development includes stability of graded slopes, corrective grading for planned building sites, and the presence of moderate to highly expansive soil and bedrock. A design-level exploration should be conducted prior to site development once final land plans have been prepared.

We are pleased to have been of service on this project and are prepared to consult further with you and your design team as the project progresses. If you have any questions regarding the contents of this report, please do not hesitate to contact us.

Sincerely,

ENGEO Incorporated

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# 1.0 INTRODUCTION

## 1.1 PURPOSE AND SCOPE

We prepared this preliminary geotechnical exploration report for the proposed Vista Cove development in Vallejo, California. Based on the findings of our feasibility study dated April 29, 2022, we provided the following scope of services.

- Reviewed the findings in our previous feasibility study for the site.
- Performed subsurface exploration, including two dry-cored borings, 13 exploratory test pits, and one exploratory trench to identify the possible presence of landslide deposits crossing the development site and characterize the general site geology.
- Provided our preliminary conclusions and recommendations for site grading, foundation design, retaining walls, and preliminary pavement recommendations for the proposed development.

We prepared this report exclusively for you and your design team consultants. ENGEO should review any changes made in the character, design, or layout of the development to modify the conclusions and recommendations contained in this report, as necessary. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without the express written consent of ENGEO.

## 1.2 PROJECT LOCATION

The site is located just east of Wildflower Avenue and Shady Lane, as shown in the Vicinity Map, Figure 1. The Property is approximately 30 acres in area and is identified by Assessor's Parcel Numbers (APNs) 0079-171-170, 0079-120-100, and a portion of 0079-220-070. The Property is currently undeveloped, open space located on the hillside of a residential development in the Glen Cove area of Vallejo. Development plans indicate that approximately 18 acres are planned for residential development, 9 acres are to be dedicated to the City by the developer as open space, and 3 acres are to be dedicated to the developer by the City. The southern portion of the site is generally lower in elevation and increases in elevation towards the west. Elevations range from approximately Elevation 70 feet above mean sea level (msl) in low-lying areas (eastern portion of the site) up to approximately Elevation 290 feet msl (southwestern boundary of the site). Vegetation on most of the site generally consists of weeds and grasses, with trees and wetland vegetation lining the two drainages that cross the site.

The upslope development (Glen Cove Hills) was constructed in the early 1980s, with significant cuts and fills to achieve the current site grades. A fill slope approximately 50 feet high and 2:1 (horizontal: vertical) was observed along the southwestern portion of the property. There are two storm drain outlets from Glen Cove Hills that were actively flowing during our site visit, Water is collected and conveyed within the two drainages that bisect the site west to east.

## 1.3 PROPOSED DEVELOPMENT

Based on the conceptual plan received via email on August 4, 2022, from dk Engineering, the project will include cuts and fills of up to 24 feet with graded slope configurations as steep as 2:1 (horizontal: vertical) and up to 46 feet tall. Retaining walls (up to 12 ½ feet in height) are shown in several areas at the top of fill slopes and the base of planned cut slopes. The current development plan depicts 52 single-family units, as shown in the Site Plan, Figure 2. Access to the project is depicted off Shady Lane and Wildflower Avenue. Development is anticipated to include roadway construction, underground utilities, and stormwater detention basins associated with the project.

# 2.0 REGIONAL GEOLOGY AND SEISMICITY

## 2.1 REGIONAL GELOGIC SETTING

The project site is situated regionally within the Coast Ranges Province. The Coast Ranges Province has a complex geological history. The Coast Ranges are characterized by complex folding and faulting that has resulted in a series of northwest-trending mountain ranges and intervening valleys. Active faulting found in the Coast Ranges has developed in response to the relative motion along the transform boundary between the North American and Pacific Tectonic Plates which, in total, is considered to be approximately 5 cm per year (Argus and Gordon, 1991). Strain associated with the relative motion of the two plates is distributed across a broad area from the San Gregorio fault offshore to just east of the Sierra Nevada. The San Andreas fault accommodates a significant portion of the relative plate motion with a geologic slip rate of approximately 2.5 to 3 cm per year. The remaining relative plate motion is partitioned along a series of faults within the broad zone of deformation with the highest slip rates occurring on faults adjacent to the San Andreas fault. In the San Francisco Bay Area, these faults include the Hayward, Rogers Creek, Calaveras, Concord, Green Valley, and Greenville faults, as well as other shorter fault segments.

More specifically, the site is located in the hills approximately 1 mile north of Southhampton Bay and Dillon Point on the north side of the Carquinez Strait. Based on geologic mapping by Dibblee (2005), the site is underlain by upper Cretaceous Panoche formation (Figure 3). We also reviewed regional geologic mapping by Crane (1988) and Graymer (1999). Dibblee maps the Southampton fault approximately 500 feet east of the site boundary. This same fault is mapped by Crane as a west-dipping thrust fault, and shown as concealed below Bay Mud deposits by Graymer. The Southampton fault is depicted on the USGS Quaternary Fault and Fold Database (Bryant, 2017) consistent with Dibblee, about 500 feet east of the site, and is described as an undifferentiated Quaternary aged reverse right-lateral fault. Crane also maps the axis of a north-trending syncline through Southampton Bay east of the site. Based on interpretations by Crane, this syncline may represent the northward continuation of the Martinez syncline. Bedding at the site is mapped with a northwest strike and dipping from 35 to 45 degrees to the west.

Regional landslide mapping by Nilsen (1975) and Bortugno (1987) was reviewed as part of our study. Landslide mapping by Bortugno is depicted in Figure 5. Bortugno maps the landslides flanking the north dipping slope, just south of the proposed development area, and a larger landslide (queried) crossing through the center of the development area. Nilsen (1975) maps a landslide upslope of Silktree Lane and the existing Glen Cove Development and does not depict any landslides crossing the development area. The California Geological Survey (CGS) provides an online "Landslide Inventory" GIS database. Consistent with the queried landslide mapped by Bortugno (Figure 2), the CGS identifies the area with a "**?**" meaning the landslide deposit is uncertain or questionable.

## 2.2 FAULTING AND SEISMICITY

The site is not located within a State of California Earthquake Fault Hazard Zone for active faults and no signs of recent faulting were observed during our site reconnaissance mapping. The San Andreas fault represents an active plate boundary that is expected to produce the maximum probable earthquake for the region. Other active faults of coastal California are lesser-order features of the same stress-strain system. The Greenville and Concord/Green Valley faults are mapped approximately 3.5 miles east of the site, the West Napa fault is located about 6 miles to the northwest, the Hayward-Rodgers Creek fault is mapped approximately 11 miles southwest from the site, and the San Andreas fault is mapped approximately 29 miles from the site.

Numerous small earthquakes occur every year in the nearby San Francisco Bay Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of these faults and significant historic earthquakes recorded within the region.

Historically, strong earthquakes (>M7) have occurred in the nearby Bay Area with many low-magnitude earthquakes recorded every year. It should therefore be expected that the site will be subjected to moderate to severe ground shaking at some point during the project design lifetime.

The 2014 Working Group on California Earthquake Probabilities evaluated the regional seismicity of the Bay Area and published their results as The Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3). The Working Group periodically attempts to summarize seismic risk in California with time-dependent earthquake rupture forecasts, in which the probabilities of future events are conditioned upon the dates of previous earthquakes. According to UCERF3, there is an aggregated 72 percent probability of 6.7 $M_W$ or greater earthquake on an active Bay Area fault over the next 30 years.

# 3.0 FIELD EXPLORATION AND GEOLOGIC MAPPING

## 3.1 EXPLORATION AND SUBSURFACE CONDITIONS

Our supplemental exploration included drilling two continuous “dry-core” borings within a queried landslide area to confirm the presence or absence of landsliding. The borings were drilled on August 4 and 5, 2022, utilizing a track-mounted CME-55 drill rig to a maximum depth of up to 50 feet below ground surface (bgs). Additionally, 13 test pits and one trench were excavated within the proposed development and adjacent hillslopes utilizing a tracked excavator (Figure 2). The test pits and trench were excavated on July 13 and 14, 2022, to a maximum depth of approximately 11 feet bgs.

In Boring 1-B1, colluvial soil was encountered to a depth of 3 feet bgs. Extremely weak to weak mudstone bedrock (Kp) interbedded with strong indurated sandstone and shale was encountered from 3 feet to the bottom of the boring. The bedrock was closely fractured to crushed in zones, partially due to the method of drilling. Very hard drilling was encountered at 17½ feet to 25 feet bgs. No features indicative of landsliding were observed in the recovered core samples.

In Boring 1-B2, colluvial soil consisting of very stiff fat clay was encountered to a depth of 6 feet bgs. Extremely weak to weak mudstone bedrock (Kp) interbedded with strong to very indurated sandstone and siltstone was encountered from 6 feet to the bottom of the boring. The bedrock was closely fractured to crushed in zones, partially due to the method of drilling. Very hard drilling (interpreted as very strong sandstone interbeds) was encountered at 10 feet to 13 feet, 15½ to 22½ feet, and 40 to 45 feet bgs. No features indicative of landsliding were observed in the recovered core samples.

Test Pits 1-TP1 through 1-TP9 were excavated in the previously mapped queried landslide area crossing the site. Stiff to very stiff colluvial deposits consisting of lean to fat clay were encountered to a depth of up to 9 feet. Underlying the colluvial deposits (gradational contact), weak to very weak interbedded sandstone, siltstone, and mudstone were encountered to the depth of excavation. No features indicative of landsliding were observed within the test pit excavations.

Test Pits 1-TP10 through 1-TP13 were excavated in planned development areas to characterize bedrock structure and thickness of colluvial deposits. Stiff to very stiff colluvial deposits consisting of lean to fat clay were encountered to a depth of up to 7 feet. Underlying the colluvial deposits (gradational contact), weak to very weak interbedded sandstone, siltstone, and mudstone were encountered to the depth of excavation.

Trench 1-T1 was excavated in the upslope portion of the previously mapped queried landslide area crossing the site. The trench extended approximately 110 feet and up to 10 feet deep. Colluvial deposits up to approximately 9 feet thick were observed in gradational contact with the underlying bedrock. The colluvium consisted of lean to fat stiff clay. The underlying bedrock consisted of weak interbedded sandstone and claystone with bedding ranging from north 8 east to north 33 east and dipping 32 to 45 degrees west. No features indicative of landsliding were observed during exploration, such as graben fills, fracture fills, dilated bedrock, prominent shearing, or gouge.

An ENGEO Geologist logged the borings, test pits, and trench in the field. The exploration logs are included in Appendix A of this report. The trench log is included in Figure 9. The logs depict subsurface conditions encountered at the time of our exploration; however, subsurface conditions will vary with time.

## 3.2 HISTORIC AERIAL PHOTOGRAPH REVIEW

We reviewed stereo-paired aerial photographs as part of our study to observe the presence of geomorphic features indicative of landsliding at the site. We reviewed the photographs for features such as linear discontinuities in the rock or soil, offset drainages, linear scarps, topographic lows, and/or vegetation patterns or breaks in slope. Features indicative of landsliding were observed in several photographs spanning years from 1937 to 1989 for Landslides 1 through 6.

## 3.3 SITE RECONNAISSANCE AND GEOLOGIC MAPPING

Surface geologic mapping, based on photo review and site reconnaissance, was performed as part of this study, as depicted in Figure 2 and interpreted on cross sections in Figure 6. Mapping was supplemented by subsurface findings, as described in subsequent sections of the report. Site mapping focused on bedrock exposures, existing fills, landsliding, and geomorphological features to provide a preliminary surface geologic map. Below are descriptions of the geologic units observed during mapping at the site, as shown in Figure 2.

### 3.3.1 Existing Fill (Qaf)

Existing fills (Qaf) are mapped along the west side of the site and are associated with mass grading for the Glen Cove development (Figure 2). The existing fills observed during our site reconnaissance and in 1981 aerial photographs appear to generally be derived from local bedrock cuts typical of the area.

### 3.3.2 Colluvial Deposits (Qc)

Colluvium (Qc) generally overlies the low-lying portions of the site, specifically the two drainages that cross the site and a small swale along the north side of the site. Colluvium is material that erodes from ridgelines and slopes, is transported predominantly by sheet wash, and accumulates in the adjacent swales. Colluvial deposits are typically compressible and weak, and based on our experience in the area, have the potential to be expansive. Colluvium was encountered across the site during our exploration and up to 10 feet thick as observed in 1-TP3.

### 3.3.3 Landslide Deposits (Qls)

As previously discussed, published geologic mapping by Bortugno (1987) shows a queried landslide area crossing through the site, Figure 5. Based on our field exploration, no features indicative of landsliding were observed in the borings, test pits, or trench. Topographic lows in this area are likely related to differential weathering and bedrock structure and are generally consistent in bedding observed in the excavations. Based on a review of the published maps, interpretation of aerial photographs, and our subsurface exploration, we identified six landslide areas adjacent to or within the property, included in Figure 2. The landslides at the site are classified as shallow soil creep/earthflows, shallow landslide deposits, and deep-seated bedrock landslides. Soil creep earthflows are generally slow-moving shallow landslides that typically mobilize during significant rainfall events and usually include the overlying surface soil. Shallow landslides at the site are characterized by rotational failures predominantly including surficial and colluvial soil, and may affect some portion of upper weathered bedrock units and likely up to 20 feet deep. Deep-seated bedrock landslides involve primarily rock, but may also include some surficial soil material, and are likely 30 to 50 feet deep. No landslide deposits were encountered in excavations or borings during our exploration.

It is our opinion that the identified landslide areas have a relatively high likelihood of experiencing instability. Conceptual mitigation measures are provided below for identified landslide areas that have been designated Landslide Areas 1 through 6 in Figure 2 for discussion purposes. The relationship of each landslide area to the planned development and conceptual mitigation measures for each landslide area is summarized in Table 3.3.3-1.

**TABLE 3.3.3-1: Preliminary Landslide Classification**

| LANDSLIDE DESIGNATION | LANDSLIDE CLASSIFICATION | DEVELOPMENT IMPACTS | MITIGATION MEASURES |
|---|---|---|---|
| 1 | Deep-Seated Bedrock; Wedge Failure | Upper portion of slide crossing proposed open space area. | Outside of development area, no mitigation required. |
| 2 | Deep-Seated Bedrock | Off site within Benicia State Rec Area and not affecting current site development. | Outside of development area, no mitigation required. |
| 3 | Shallow; Rotational | Off site and not affecting current site development. | Outside of development area, no mitigation required. |
| 4 | Shallow; Rotational | Predominantly within open space parcel with portion on the east crossing into planned balance area. | Remove landslide deposits from portion within development area. |
| 5 | Shallow; Rotational | Outside of proposed development area and project boundary. | Outside of development area and project boundary, no mitigation required. |
| 6 | Soil Creep/ Earthflow | Predominantly within open space parcel with portion on the east crossing into planned balance area. | Remove landslide material from portion within development area. |

### 3.3.4 Panoche Formation (Kp)

Bedrock at the site consists of interbedded sandstone, siltstone, claystone, shale, and mudstone of the Cretaceous Great Valley Sequence Panoche Formation (Kp). Based on our experience with similar projects in the area, bedrock exposures along Shady Lane, and our subsurface exploration, the bedrock is generally well cemented, extremely weak to strong, and beds of more well indurated sandstones are common. Regional bedding is depicted striking northwest and dipping 35 to 45 degrees west. We collected measured bedding orientations on bedrock exposures adjacent to Shady Lane, and within test pit excavations, observed bedding striking from north 3 degrees west to north 65 east and dipping 32 to 60 degrees to the west.

### 3.4 LABORATORY TESTING

We performed percent passing #200 sieve (ASTM D1140), Atterberg limits (ASTM D4318), and hydrometer (ASTM D422) testing. Individual test results are also included in Appendix B.

### 3.5 GROUNDWATER CONDITIONS

No groundwater was encountered within the test pits, trench, and borings. The two drainages crossing the site were observed to have consistent water flow from two storm drain outlet locations associated with the existing Glen Cove Hills development. Additionally, two seepage areas were observed during our site reconnaissance, as depicted in Figure 2. The seeps were identified by saturated ground surfaces and dense vegetation. Fluctuations in groundwater levels occur seasonally and over a period of years because of variations in precipitation, temperature, irrigation, and other factors. Future irrigation may cause an overall rise in groundwater levels.

## 4.0 PRELIMINARY CONCLUSIONS

It is our opinion from a geotechnical and geologic viewpoint that the proposed development is feasible provided the preliminary conclusions and recommendations contained in this report are incorporated into future planning for the development. The main geotechnical and geologic concerns for the proposed development include (1) stability of graded slopes, (2) corrective grading for planned building sites, and (3) presence of moderate to highly expansive soil and bedrock.

Supplemental design-level geotechnical exploration should be performed to provide site-specific recommendations for site preparation, remedial and design grading, foundation design, site improvements, and drainage. The supplemental exploration should further characterize subsurface conditions to determine mitigation measures to address geotechnical and geologic hazards.

### 4.1 SLOPE STABILITY

Proposed graded slopes at the site (Figure 2) are depicted as 2:1 (horizontal: vertical) and up to 46 feet tall with intermittent benches. Based on our experience and geologic conditions at the site, proposed cut slopes will require reconstruction as drained, engineered fill slopes. In general, 2:1 cut and fill slopes will require keyway buttresses and geogrid reinforcement for construction. Slope stability analysis should be performed during design-level geotechnical study and once final development plans are available to determine corrective grading configurations.

### 4.2 EXPANSIVE SOIL AND BEDROCK MATERIALS

The soil and bedrock at the site generally exhibit moderate to high shrink/swell potential with variations in moisture content. The results of Atterberg Limits determination show plasticity indices (PIs) ranging from 18 to 40, which is considered moderate to highly expansive when subject to changes in moisture content. Expansive soil and bedrock materials left unmitigated may shrink and/or swell adversely impacting site improvements, such as slabs-on-grade, pavements, and structures on shallow foundations. Our recommendations to mitigate adverse effects of expansive soil and bedrock are discussed in subsequent portions of this report.

## 4.3 COMPRESSIBLE SOIL AND SOFT COLLUVIAL DEPOSITS

The colluvial deposits encountered during our exploration included soft or compressible materials over bedrock. To minimize settlement of the softer colluvium due to building loads or engineered fill loads, corrective grading measures should include the removal of compressible materials down to a hard material/bedrock. We anticipate colluvium removals of up to approximately 10 feet to achieve this recommendation. Figures 2 and 6 show the general locations of the colluvium. The anticipated depth of removal of soft and compressible soil should be determined during design-level studies.

## 4.4 SOIL CREEP

Colluvial soil on steeper slopes is subject to soil creep. Soil creep is the slow downslope movement of soil that occurs with the annual cycle of wetting and drying under the influence of gravity. The potential for adverse impacts from soil creep can be minimized by benching through surficial soil during fill placement, as recommended in this report, or by design of drilled pier foundation systems to accommodate lateral loads from soil creep.

## 4.5 BEDROCK RIPPABILITY

Based on field observations during excavation of test pits, trench, borings, and experience on projects in the immediate vicinity, we opine that in general bedrock units at this site should be considered rippable with conventional heavy construction equipment (such as a D-8 Bulldozer). Localized well-cemented beds and occasional well-cemented concretions may be encountered that will require more ripping effort. Trenching for utilities should be possible with conventional equipment. As noted above, localized well-cemented beds may be encountered that may necessitate use of heavy equipment such as track-mounted excavators.

In general, all soil and bedrock materials observed on the site appear suitable for use as engineered fill, if properly processed. If rocks greater than 6 inches in diameter are encountered during grading, these should be placed in accordance with recommendations provided in Section 5.3 – Selection of Materials.

## 4.6 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, ground lurching, soil liquefaction, and lateral spreading. These hazards are discussed in the following sections. Based on topographic and lithologic data, the risk from regional subsidence or uplift, tsunamis, or seiches is considered low at the site.

### 4.6.1 Ground Rupture

Since there are no known active faults crossing the site and the property is not within a State of California Earthquake Fault Hazard Zone, the likelihood of primary fault ground rupture is considered remote.

### 4.6.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, all structures should be designed using sound engineering judgment and the current California Building Code (CBC) requirements, as a minimum.

### 4.6.3 Liquefaction/Clay Soil Softening

Soil liquefaction is a phenomenon under which saturated, cohesionless, loose soil experience a temporary loss of shear strength when subjected to the cyclic shear stresses caused by earthquake ground shaking. The soil materials encountered within the site generally consist of clayey soil and bedrock that are not susceptible to liquefaction.

### 4.6.4 Seismically Induced Landsliding

Seismically induced landslides are triggered by earthquake ground shaking. The risk of this hazard is greatest in the late winter when groundwater levels are highest and hillside colluvium is saturated. As with all slopes in the region, this risk is also present at the site to varying degrees depending on the slope conditions and time of year. The hazard of seismically induced landslides to the proposed structures can be best mitigated by properly engineered stabilization of planned slopes, as recommended in this report.

## 4.7 CBC SEISMIC DESIGN PARAMETERS

Based on the subsurface conditions observed during exploration, we preliminarily characterized the site as Site Class C. We provide the 2019 CBC seismic design parameters in the table below, which include design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake ($MCE_R$) spectral response acceleration parameters. Future design-level studies should include evaluation of the shear-wave velocity of the subsurface to confirm site class.

**TABLE 4.7-1: 2019 CBC Seismic Design Parameters (Latitude: 38.082173, Longitude: -122.200268)**

| PARAMETER | VALUE |
|---|---|
| Site Class | C |
| Mapped $MCE_R$ Spectral Response Acceleration at Short Periods, $S_S$ (g) | 1.5 |
| Mapped $MCE_R$ Spectral Response Acceleration at 1-second Period, $S_1$ (g) | 0.6 |
| Site Coefficient, $F_a$ | 1.2 |
| Site Coefficient, $F_v$ | 1.4 |
| $MCE_R$ Spectral Response Acceleration at Short Periods, $S_{MS}$ (g) | 1.8 |
| $MCE_R$ Spectral Response Acceleration at 1-second Period, $S_{M1}$ (g) | 0.84 |
| Design Spectral Response Acceleration at Short Periods, $S_{DS}$ (g) | 1.2 |
| Design Spectral Response Acceleration at 1-second Period, $S_{D1}$ (g) | 0.56 |
| Mapped MCE Geometric Mean ($MCE_G$) Peak Ground Acceleration, PGA (g) | 0.5 |
| Site Coefficient, $F_{PGA}$ | 1.2 |
| $MCE_G$ Peak Ground Acceleration adjusted for Site Class effects, $PGA_M$ (g) | 0.6 |

### 4.8 SOIL CORROSION POTENTIAL

We collected two samples during our exploration and transported them to CERCO Analytical and tested for concentrations of water-soluble sulfate and chloride (Cl) in accordance with ASTM D4327. The sample locations are specified in the attached analytical results, Appendix C.

The soluble sulfate concentrations were 92 ppm (0.03% by weight) and "none detected". The 2019 California Building Code references the 2014 American Concrete Institute Manual, (ACI 318-14) Chapter 19, Sections 19.3 for concrete requirements based on sulfate exposure. In accordance with ACI criteria, the soil is classified as Exposure Class S0. Cement type and water-cement ratio are not specified for this range.

The results for chloride concentration in the samples were 92 and 110 ppm. For concrete in direct contact with soil containing concentrations of chloride ions in excess of 500 ppm, the Post-Tensioning Institute (PTI) recommends additional protection from corrosion for the tendons and reinforcing. The results show levels of chloride that do not exceed 500 ppm. Therefore, preliminarily, no additional measures are specified beyond the standard measures specified by ACI 318-14 and 423.7.

A full evaluation of possible corrosion impacts to site improvements has not been conducted on site soil because of the volume of cut and fill that will be necessary to bring the site to design grades. Once design grades are achieved, supplemental testing can be performed and a corrosion specialist can be retained.

## 5.0 PRELIMINARY EARTHWORK RECOMMENDATIONS

### 5.1 GRADING, DEMOLITION, AND STRIPPING

The following preliminary recommendations are for initial land planning and preliminary estimating purposes. Final recommendations regarding site grading and foundation construction will be provided after design-level exploration has been undertaken. Grading should begin with the removal of existing structures, if any, including their foundations. Underground structures, such as buried pipes, septic tanks, and leach fields, if any, which will be abandoned or are expected to deteriorate, should be removed from the project site entirely.

All existing artificial fill, vegetation, and soft or compressible soil should be removed, as necessary, for project requirements. The depth of removal of these materials should be determined by the geotechnical engineer's qualified representative in the field at the time of grading. Evaluation of unsuitable deposits should be performed during grading by sampling and laboratory analyses.

Areas to receive fill or structures and those areas that serve as borrow for fill should be stripped of existing vegetation. Topsoil is estimated to be from 3 to 6 inches in thickness depending on location. Tree roots should be removed to a depth of at least 3 feet below finished grade in cut areas and 3 feet below original grade in fill areas. Subject to approval by the landscape architect, strippings and organically contaminated soil that are not suitable for use as engineered fill may be used in landscape areas. Any topsoil that will be retained for future use in landscape areas should be stockpiled in areas where it will not interfere with the mass grading.

Within the development areas, excavations resulting from demolition and stripping which extend below final grades should be cleaned to firm undisturbed soil, as determined by the geotechnical engineer's representative. Following clearing and grubbing, all depressions in areas to be filled should be scarified, moisture conditioned, and backfilled with compacted engineered fill. The requirements for backfill materials and placement procedures are the same as those for engineered fill, as described in Section 5.5 – Placement of Fill.

## 5.2 CORRECTIVE GRADING

Based on the proposed site grading and slopes, corrective grading, including removal of compressible colluvium, excavation of buttress keyways, cut and cut-fill lot excavation, differential fill excavation, and construction of subsurface drainage facilities, is anticipated. Keyway and subdrain configurations should be provided during design-level studies and based on final development plans, including corrective grading plans and cross sections. Typical keyway and subdrain details are included in Figures 7 and 8.

## 5.3 SELECTION OF MATERIALS

With the exception of the organically contaminated near-surface material, the site soil and rocks containing less than 3 percent organics are suitable for use as engineered fill. Imported fill material should meet the above requirements and have a plasticity index (PI) similar to on-site soil material.

Placement of oversized rock in the fill should be done according to the following specifications.

- During grading, rock fragments up to 6 inches in maximum size should be placed in the deeper fill areas. No rock fragments larger than 6 inches in diameter shall be placed in the upper 10 feet of finished grade.
- If oversized rock fragments are encountered, these should not exceed 18 inches in any dimension if placed at selective landscape areas. Larger rock sizes should be broken mechanically, either by the heavy bulldozers rolling on them or by a pneumatic hammer mounted on a backhoe. The rock should be spread and mixed with fines and should not be allowed to nest. Engineered fill consisting of rock fragments only is not allowed. The rock should be mixed with fines at a ratio of 1 to 10, or one load of rock fragments to 10 loads of fines, as approved by ENGEO during grading.

## 5.4 GRADED SLOPES AND SLOPE STABILIZATION

The following preliminary guidelines may be used when considering slope gradients, heights, and retaining walls:

- In general, graded 2:1 (horizontal: vertical) slopes may be constructed up to 10 feet in vertical height. If higher vertical 2:1 slopes are planned, 2:1 slopes up to a maximum vertical height of 30 feet high may be constructed using geogrid reinforcement. Slopes exceeding 30 feet in height should include benches and/or concrete ditches, as designed by the civil engineer.
- Graded 2½:1 slopes (unreinforced with geogrid) may be constructed up to 15 feet in vertical height. If higher vertical slopes are planned, 2½:1 slopes up to a maximum vertical height of 30 feet high may be constructed using geogrid reinforcement. Slopes exceeding 30 feet in height should include benches and/or concrete ditches, as designed by the civil engineer.

- Graded 3:1 slopes, or flatter, may exceed 30 feet and do not require benches and/or concrete ditches. Major slopes exceeding 50 feet in vertical height should include a minimum 20-foot-wide debris bench along the base of slope.
- Graded cut and fill slopes exceeding 30 feet in height should include benches and/or concrete ditches, as designed by civil engineer.

The above guidelines may be considered in combination with vertical retaining wall systems, such as MSE retaining walls; however, such walls upon shallow foundations with downslope conditions will require greater embedment than walls with level foreground at slope bottoms. As an alternative to the slope gradient recommendations described above, if steeper slope gradients exceeding the above-noted maximum vertical heights are desired, such slopes could be specially designed using appropriate geogrid reinforcement. Geogrid reinforced slopes should be designed and may include primary and secondary geogrid reinforcement layers. As a general design consideration for geogrid reinforced slopes, if selected the primary horizontal reinforcement would extend on the order of 1.5 times the total vertical height of the slope, comprising the outer geogrid reinforced buttress zone of the slope; the typical vertical spacing of geogrid layers would be anticipated ranging from 1½- to 2½-foot spacing, depending on the total vertical slope height. Specific slope recommendations should be provided during design level studies and once final plans are available.

All major cut slopes should be reviewed by an ENGEO Certified Engineering Geologist for slope conditions that might be detrimental to slope stability. If areas of instability are identified during grading, such as adverse bedrock orientation or structure or groundwater seepage conditions, these cut slopes may require overexcavation and reconstruction; if necessary supplemental recommendations to mitigate cut slopes would be provided during construction.

## 5.5 PLACEMENT OF FILL

After removal of soft soil and loose fill, the exposed non-yielding surface of all areas to receive minor fills, secondary slabs-on-grade, or pavements should be scarified to a depth of 12 inches, moisture conditioned, and recompacted to provide adequate bonding with the initial lift of fill. All fill should be placed in thin lifts. The lift thickness should not exceed 8 inches or the depth of penetration of the compaction equipment used, whichever is less. Test procedures should be determined in accordance with ASTM D1557. Additional samples will be collected during site grading and transported to our laboratory for compaction curve testing.

**TABLE 5.5-1: Fill Placement Specifications**

| LOCATION | MINIMUM RELATIVE COMPACTION | MINIMUM MOISTURE CONTENT (percent above optimum) |
|---|---|---|
| General Fill (< 50 feet deep) | 90 | 3 |
| General Fill (≥ 50 feet deep) | 95 | 2 |
| Keyway | 95 | 2 |

## 6.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

The following preliminary foundation recommendations are provided for planning purposes and should be evaluated once the final foundation layouts are provided.

It is our opinion that the proposed residential structures can be supported on structural mat foundations (such as post-tensioned mat foundations) provided that the structures are located on level ground and at least 10 feet from the top of slopes. A minimum mat thickness of 10 inches should be considered; however, the actual thickness and perimeter embedment recommendations should be determined by the structural engineer based on structural calculations.

## 7.0 PRELIMINARY RETAINING WALL RECOMMENDATIONS

Unrestrained walls constructed on level foreground should be designed for active lateral fluid pressure considering drained conditions, using the parameters below.

**TABLE 7.0-1: Retaining Wall Design Parameters**

| BACKFILL SLOPE CONDITION | ACTIVE PRESSURE (pcf) |
|---|---|
| Level | 50 |
| 3:1 | 60 |
| 2:1 | 70 |

Passive pressures acting on shallow foundations and keyways may be assumed as 250 pounds per cubic foot (pcf) provided that the area in front of the retaining wall is level for a distance of at least 10 feet or three times the depth of foundation and keyway, whichever is greater. The upper 1 foot of soil should be excluded from passive pressure computations unless it is confined by pavement or a concrete slab. The friction factor for sliding resistance may be assumed as 0.35. It is recommended that retaining wall footings be designed using an allowable bearing pressure of 2,500 pounds per square foot (psf) in engineered fill. The footings should be at least 24 inches below lowest adjacent grades. Walls adjacent to sloping terrain should be supported on deep foundations, such as drilled piers.

Based on review of the conceptual site plan, mechanically stabilized earth (MSE) retaining walls may be feasible for many of the site retaining walls. MSE walls function as gravity structures relying on self-weight of segmental blocks at the wall face and reinforced soil mass behind the segmental blocks to resist the destabilizing forces of the retained soil. The soil reinforcement consists of geogrid reinforcement.

The following preliminary soil criteria should be incorporated into the MSE wall design.

**TABLE 7.0-2: MSE Wall Design Soil Material Parameters**

| CONDITION | COHESION (c') (pcf) | FRICTION ANGLE (∅') (degrees) | UNIT WEIGHT (γ) (pcf) |
|---|---|---|---|
| Reinforced Fill | 0 | 28 | 120 |
| Retained Soil | 0 | 28 | 120 |
| Foundation Fill | 0 | 28 | 120 |

The geotechnical engineer should be consulted on seismic design recommendations for walls that are taller than 6 feet in retained height, tiered retaining wall configurations, or where surcharge loading is present.

All retaining walls should be provided with drainage facilities to prevent the build-up of hydrostatic pressures behind the walls. Wall drainage may be provided using a 4-inch-diameter perforated pipe embedded in Class 2 permeable material, or free-draining gravel surrounded by synthetic filter fabric. The width of the drain blanket should be at least 12 inches. The drain blanket should extend to about 1 foot below the finished grades. As an alternative, prefabricated wall drain panels can be used. The upper 1 foot of wall backfill should consist of on-site clayey soil. Collector perforated pipes should be directed to an outlet approved by the civil engineer.

All backfill should be placed in accordance with the recommendations provided above for engineered fill. Light equipment should be used during backfill compaction to reduce possible overstressing of the walls.

# 8.0 STORMWATER INFILTRATION AND BIORETENTION AREAS

Due to the density of the site soil and fines content, the near-surface site soil is expected to have a low to moderate permeability value for stormwater infiltration in grassy swales or permeable pavers, unless subdrains are installed. Therefore, best management practices should assume that limited stormwater infiltration will occur at the site.

If bioretention areas are implemented, we recommend that, when practical, they be planned a minimum of 10 feet away from structural site improvements, such as buildings, streets, retaining walls, and sidewalks/driveways. When this is not practical, bioretention areas located closer to structural site improvements can either:

1. Be constructed with structural side walls capable of withstanding the loads from the adjacent improvements, or
2. Incorporate filter material compacted to between 85 and 90 percent relative compaction (ASTM D1557, latest edition) and a waterproofing system designed to reduce the potential for moisture transmission into the subgrade soil beneath the adjacent improvement.

In addition, one of the following options should be followed.

1. We recommend that bioretention design incorporate a waterproofing system lining the bioswale excavation and a subdrain, or other storm drain system, to collect and convey water to an approved outlet. The waterproofing system should cover the bioretention area excavation in such a manner as to reduce the potential for moisture transmission beneath the adjacent improvements.
2. Alternatively, and with some risk of movement of adjacent improvements, if infiltration is desired, we recommend the perimeter of the bioretention areas be lined with an HDPE tree root barrier that extends at least 1 foot below the bottom of the bioretention areas/infiltration trenches.

Site improvements located adjacent to bioretention areas that are underlain by base rock, sand, or other imported granular materials, should be designed with a deepened edge that extends to the bottom of the imported material underlying the improvement. Given the nature of bioretention systems and possible proximity to improvements, we recommend ENGEO be retained to review design plans.

# 9.0 PRELIMINARY PAVEMENT DESIGN

The following preliminary pavement section has been determined for an assumed R-value of 5, and in accordance to the design methods contained in Chapter 630 of Caltrans Highway Design Manual.

**TABLE 9.0-1: Preliminary Pavement Section**

| TRAFFIC INDEX | AC (inches) | AB (inches) |
|---|---|---|
| 5.0 | 3.0 | 10.0 |
| 6.0 | 3.5 | 13.0 |
| 7.0 | 4.0 | 16.0 |

Notes: AC – Asphalt Concrete
AB – Caltrans Class 2 aggregate base (R-value of 78 or greater)

The above preliminary pavement sections are provided for estimating only. We recommend the actual subgrade material be tested for R-value and the traffic index, and minimum pavement section(s) should be confirmed by the civil engineer and the City of Vallejo.

# 10.0 FUTURE STUDIES

As previously discussed, a site-specific design-level geotechnical exploration should be performed as part of the design process. The exploration would include additional borings and laboratory soil testing to provide data for preparation of specific recommendations regarding grading, foundation design, and drainage for the proposed development. The exploration will also allow for more detailed evaluations of the geotechnical concerns discussed in this report and afford the opportunity to provide recommendations regarding techniques and procedures to be implemented during construction to mitigate potential geotechnical/geological hazards. Slope stability analyses should be performed during design-level geotechnical study and once final development plans are available to determine corrective grading configurations.

# 11.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.3 for the proposed development. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data is representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, notify us immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, then notify the proper regulatory officials immediately.

This document must not be subject to unauthorized reuse, that is, reusing without our written authorization. Such authorization is essential because it requires us to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications, or other changes to our documents. Therefore, we must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If our scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, we cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies, or other changes necessary to reflect changed field or other conditions.

## SELECTED REFERENCES

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Nilsen, T. H., 1975, Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits, Benicia Quadrangle, USGS Open-File Map 75-277-4.

Various Aerial Photographs Reviewed; 08-20-37 ABO-52-78 and ABO-52-77; 06-29-57 ABO-33T-29 and ABO-33T-28; 06-21-65 SOL 49-30 and SOL 49-31; 03-21-70 2830-1-60 and 2830-1-59; 07-10-73 3594-1-120 and 3594-1-121; 02-20-81 GSVEZR 2-20 and GSVEZR 2-21; 07-18-89 AV3601-3-16 and AVR3601-3-17.

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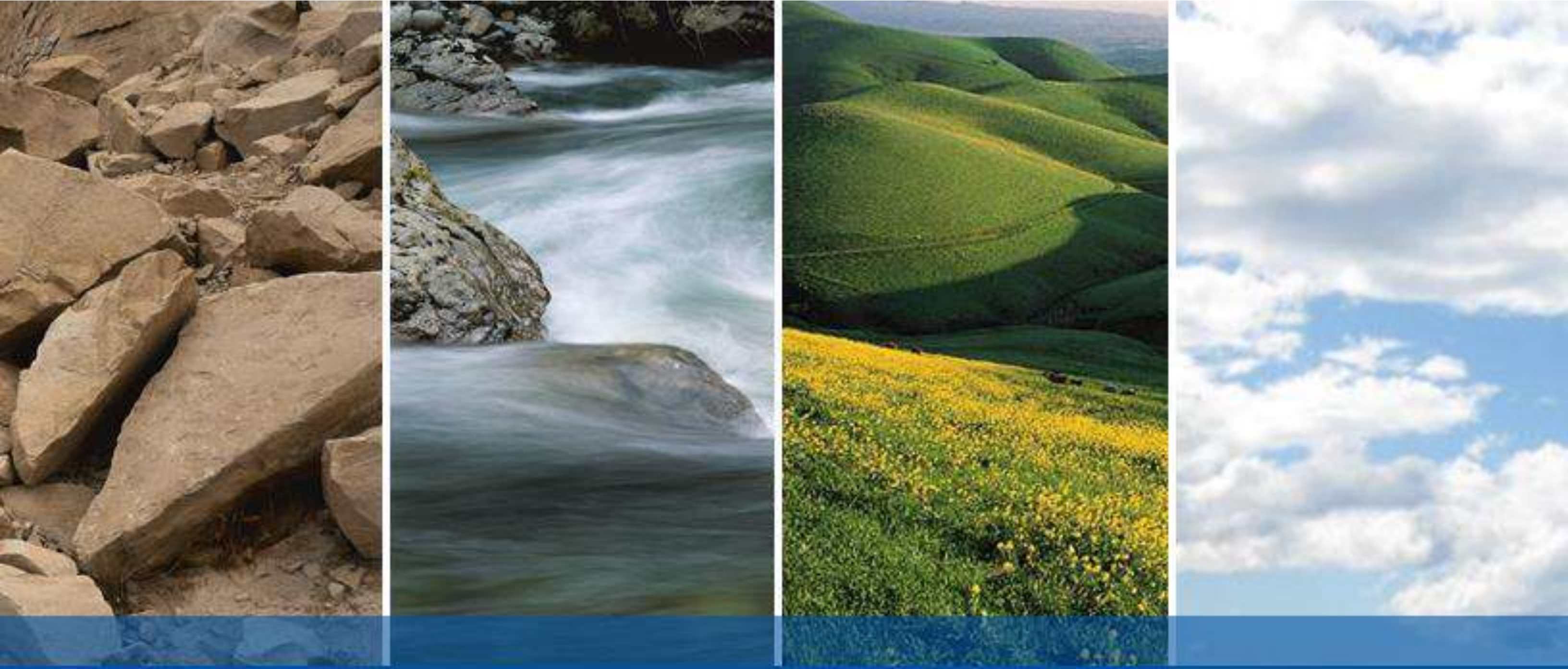
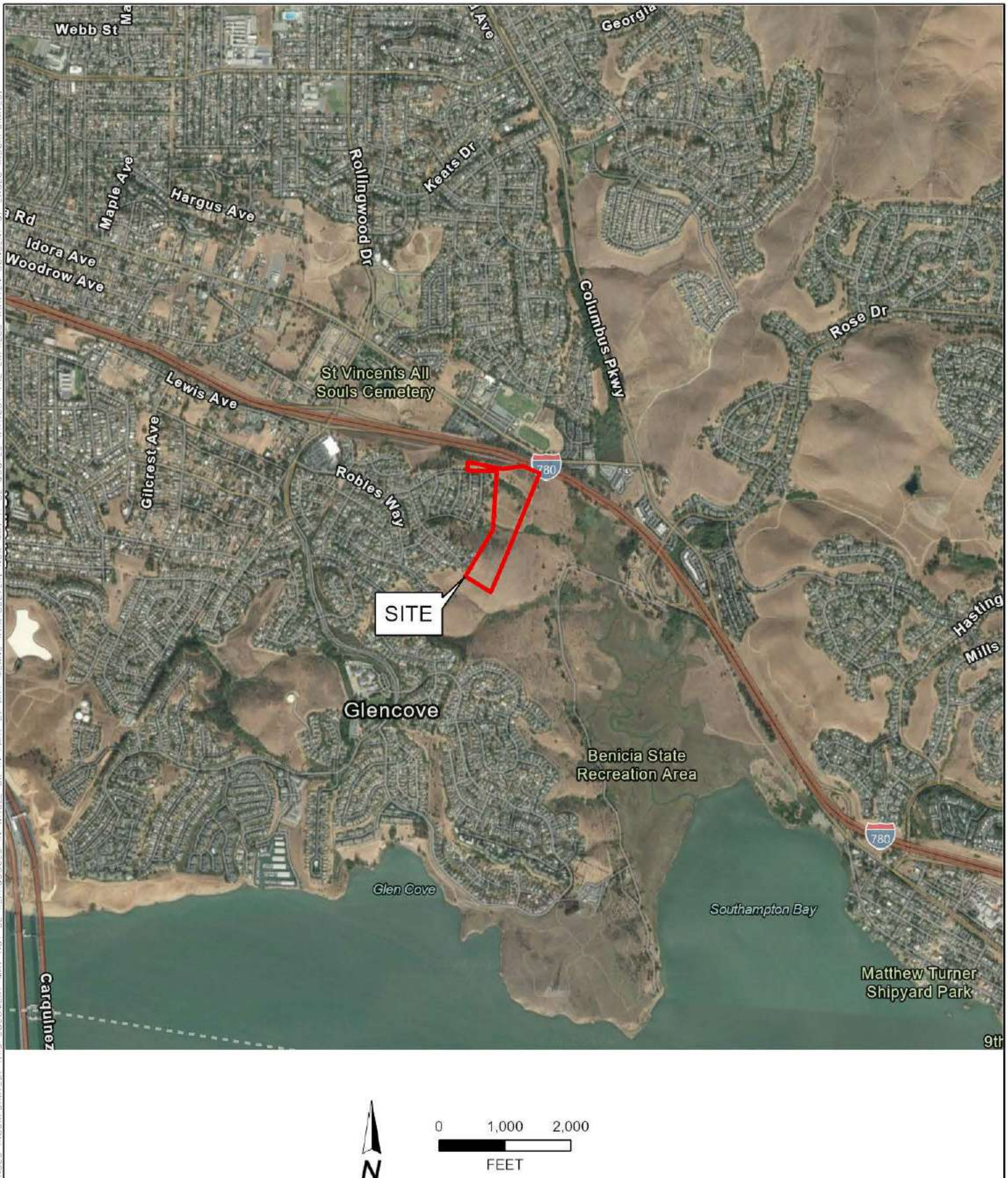


# FIGURES




BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE 10/12/2020

ENGEO
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VICINITY MAP
VALLEJO PROPERTIES - VISTA COVE
VALLEJO, CALIFORNIA

| | | |
|---|---|---|
| PROJECT NO.: 20164.000.001 | | FIGURE NO. 1 |
| SCALE: AS SHOWN | | |
| DRAWN BY: NLK | CHECKED BY: AHF | |

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LAYOUT: VICINITY USER: NLAMOTTEKERR

ORIGINAL FIGURE PRINTED IN COLOR


## EXPLANATION

*ALL LOCATIONS ARE APPROXIMATE*

- 1-B2 6' — BORING SHOWING DEPTH TO BEDROCK (ENGEO, 2022)
- 1-TP13 5' — TEST PIT SHOWING DEPTH TO BEDROCK (ENGEO, 2022)
- C C' — CROSS SECTION
- 1-T1 — TRENCH (ENGEO, 2022)
- GEOLOGIC CONTACT
- 60 — GEOLOGIC ATTITUDE
- **Qaf** — EXISTING FILL
- **Qc** — COLLUVIUM
- **Kp** — PANOCHE FORMATION BEDROCK
- SOIL CREEP/ EARTH FLOW
- SEEP
- SHALLOW LANDSLIDE DEPOSIT
- DEEP SEATED LANDSLIDE DEPOSIT
- 6 — LANDSLIDE DESIGNATION
- SOUTHAMPTON FAULT (USGS)

N

0 150 FEET

*BASE MAP SOURCE: DK ENGINEERING 2022, 2018 LIDAR TOPOGRAPHY*

| ENGEO Expect Excellence | SITE PLAN<br>VALLEJO PROPERTIES - VISTA COVE<br>VALLEJO, CALIFORNIA | PROJECT NO.: 20164.000.001<br>SCALE: AS SHOWN<br>DRAWN BY: CC CHECKED BY: AHF | FIGURE NO.<br>2 |
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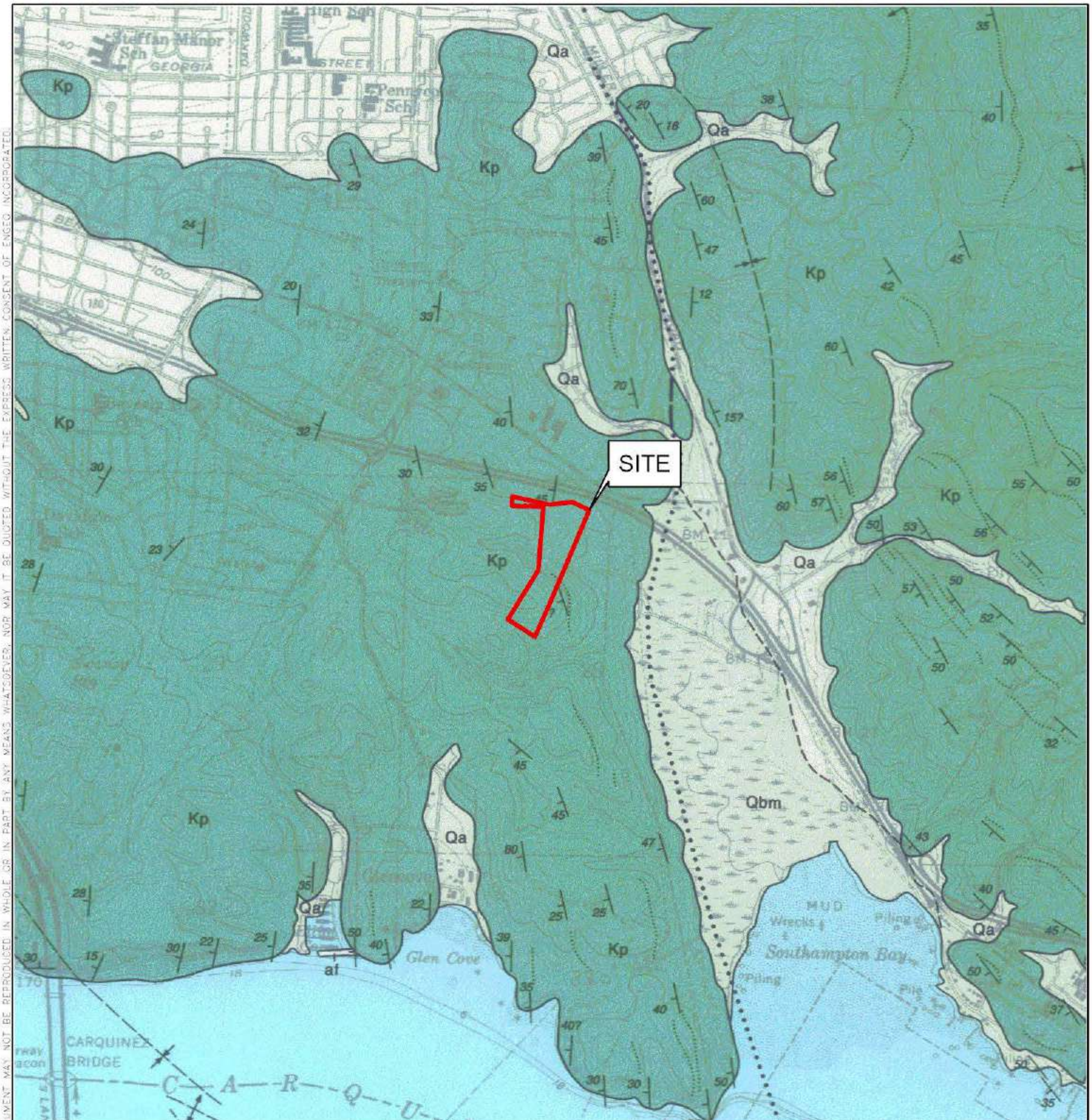


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FEET

## EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

| | |
|---|---|
| af | ARTIFICIAL FILL |
| Qa | ALLUVIAL GRAVEL, SAND AND CLAY |
| Qbm | BAY MUD |
| Kp | PANOCHE FORMATION- CLAY SHALE, DARK GRAY MICACEOUS, BEDDED, INCLUDES THIN SAND STONE |

BASEMAP SOURCE: DIBBLEE (DF-146; 2005)

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REGIONAL GEOLOGIC MAP
VALLEJO PROPERTIES - VISTA COVE
VALLEJO, CALIFORNIA

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| PROJECT NO.: 20164.000.001 | FIGURE NO. 3 |
| SCALE: AS SHOWN | |
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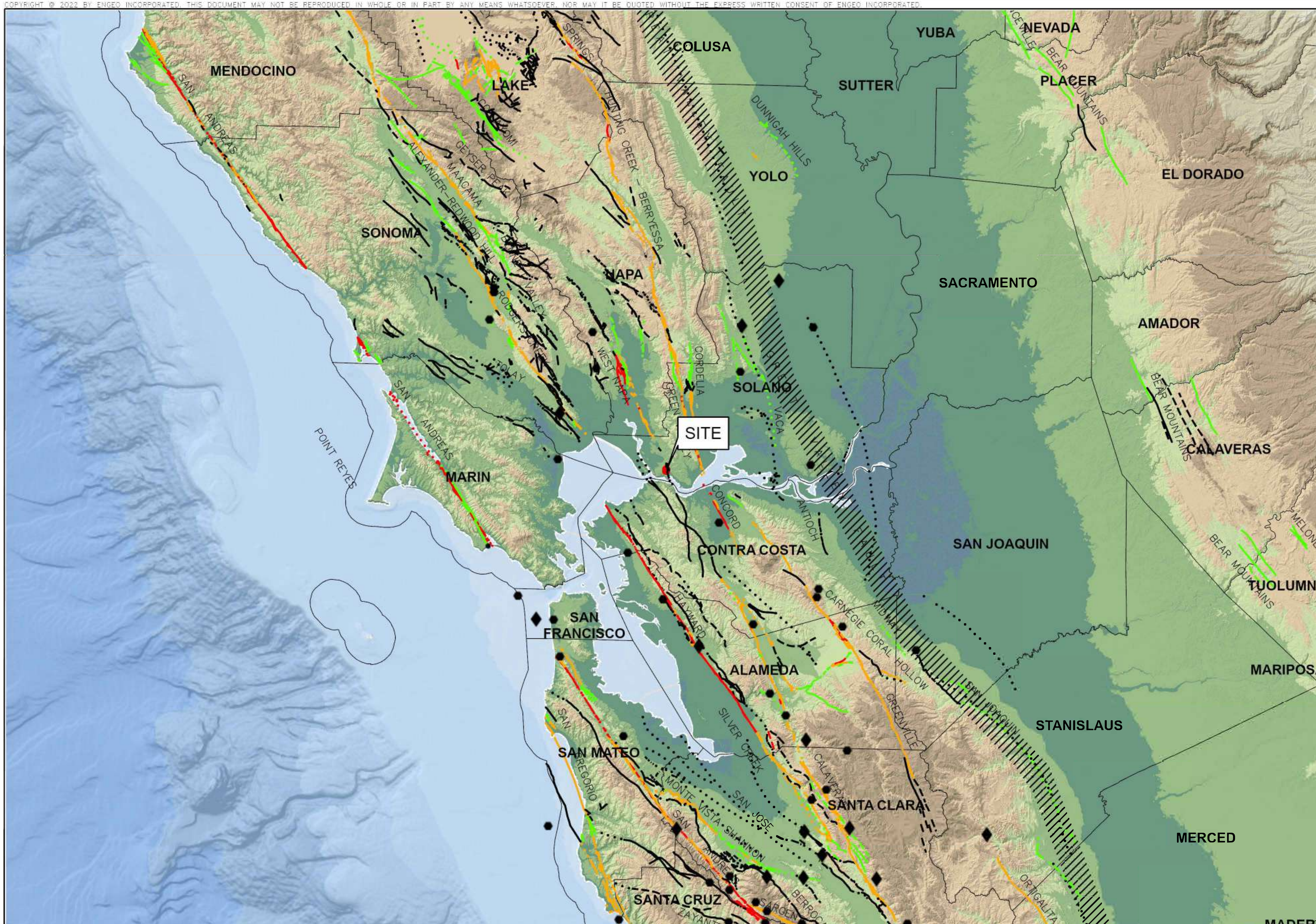


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0 8 16

Miles

## EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

**EARTHQUAKE**

- MAGNITUDE 7+
- MAGNITUDE 6-7
- MAGNITUDE 5-6

QUATERNARY FAULTS

BASED ON TIME OF MOST RECENT SURFACE DEFORMATION

- HISTORICAL (<150 YEARS), WELL CONSTRAINED LOCATION
- HISTORICAL (<150 YEARS), MODERATELY CONSTRAINED LOCATION
- HISTORICAL (<150 YEARS), INFERRED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), WELL CONSTRAINED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), MODERATELY CONSTRAINED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), INFERRED LOCATION
- LATE QUATERNARY (<130,000 YEARS), WELL CONSTRAINED LOCATION
- LATE QUATERNARY (<130,000 YEARS), MODERATELY CONSTRAINED LOCATION
- LATE QUATERNARY (<130,000 YEARS), INFERRED LOCATION
- MIDDLE AND LATE QUATERNARY (<750,000 YEARS), WELL CONSTRAINED LOCATION
- MIDDLE AND LATE QUATERNARY (<750,000 YEARS), MODERATELY CONSTRAINED LOCATION
- MIDDLE AND LATE QUATERNARY (<750,000 YEARS), INFERRED LOCATION
- UNDIFFERENTIATED QUATERNARY(<1.6 MILLION YEARS), WELL CONSTRAINED LOCATION
- GREAT VALLEY FAULT ZONE

BASE MAP SOURCE

ESRI, GEBCO, DELORME, NATURALVUE
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2018
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-PRESENT)

| ENGEO Expect Excellence | REGIONAL FAULTING AND SEISMICITY<br>VALLEJO PROPERTIES - VISTA COVE<br>VALLEJO, CALIFORNIA | PROJECT NO.: 20164.000.001<br>SCALE: AS SHOWN<br>DRAWN BY: CC CHECKED BY: AHF | FIGURE NO. 4 |
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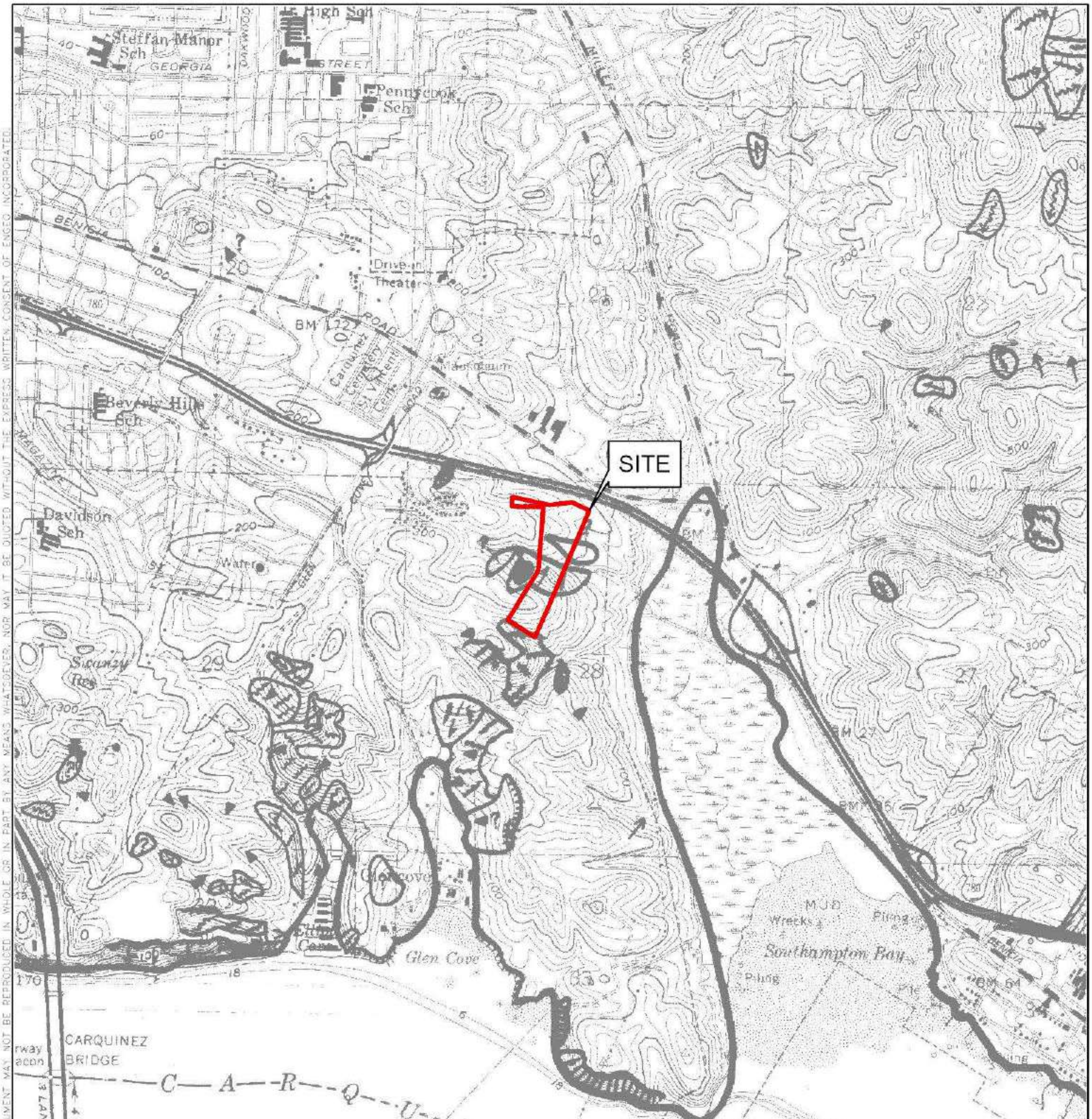


## EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- DEFINITE LANDSLIDE
- PROBABLE LANDSLIDE
- QUESTIONABLE LANDSLIDE
- EARTHFLOW
- SMALL LANDSLIDE

N

0 1,000 2,000

FEET

BASEMAP SOURCE: LANDSLIDE HAZARD IDENTIFICATION MAP NO.8 (BORTUNGO, 1987)

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REGIONAL LANDSLIDE MAP
VALLEJO PROPERTIES - VISTA COVE
VALLEJO, CALIFORNIA

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| PROJECT NO.: 20164.000.001 | | FIGURE NO. 5 |
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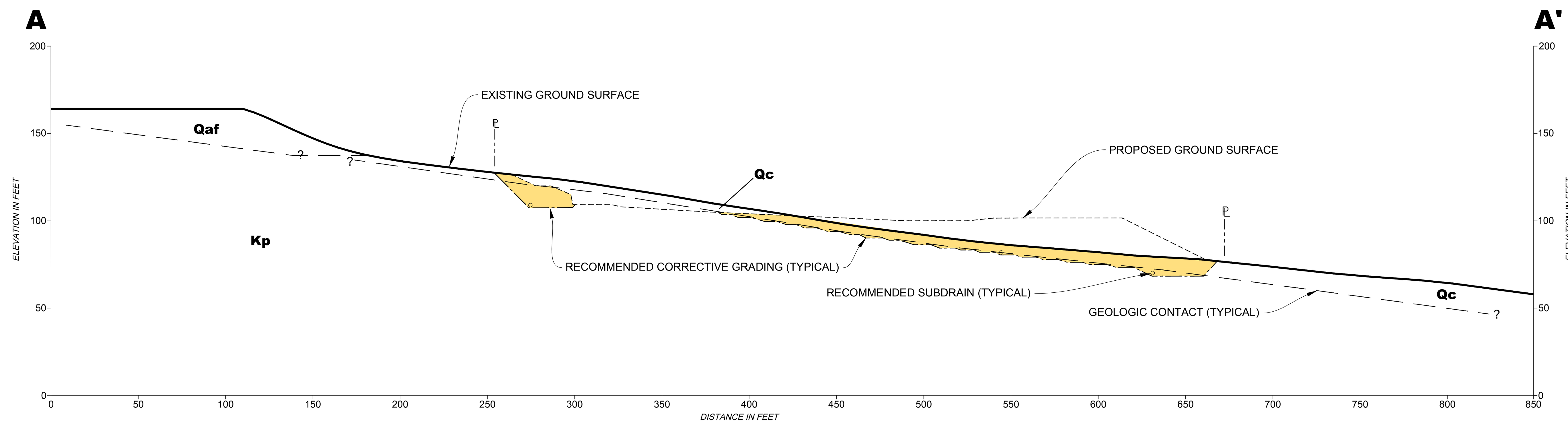
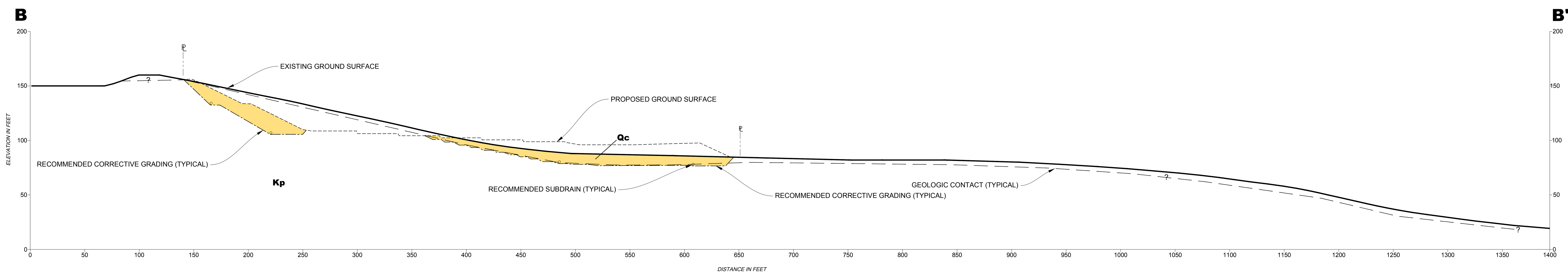
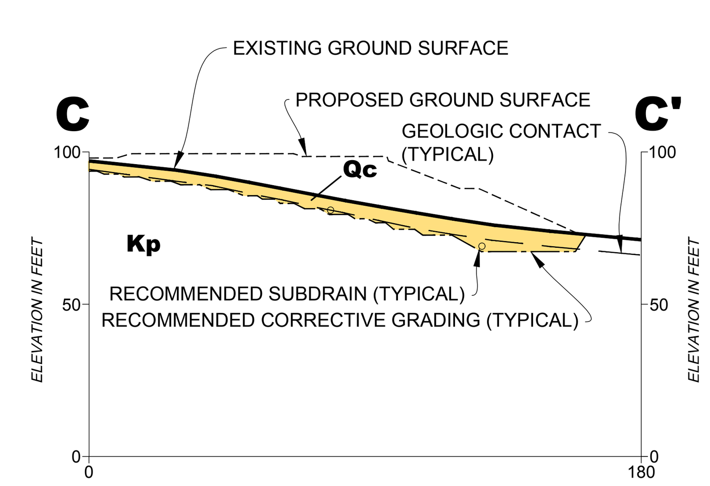


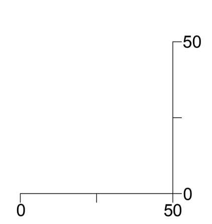

SECTION A-A'
1"=50'




SECTION B-B'
1"=50'




SECTION C-C'
1"=50'




EXPLANATION

| | |
|---|---|
| **Qaf** | EXISTING FILL |
| **Qc** | COLLUVIUM |
| **Kp** | PANOCHE FORMATION BEDROCK |
| | REMOVAL AREA |

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CROSS SECTIONS
VALLEJO PROPOERTIES - VISTA COVE
VALLEJO, CALIFORNIA

| | |
|---|---|
| PROJECT NO.: 20164.000.001 | FIGURE NO. 6 |
| SCALE: AS SHOWN | |
| DRAWN BY: JSW | CHECKED BY: AHF |

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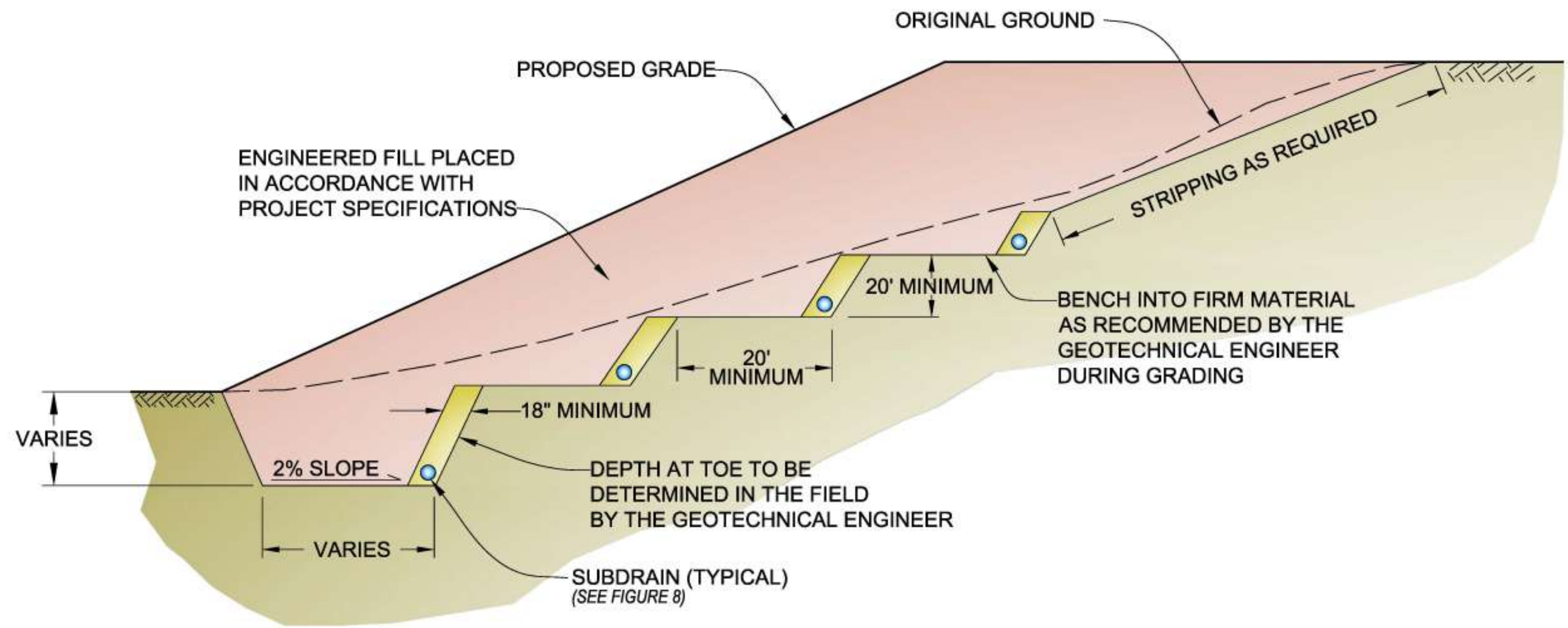


| ENGEO Expect Excellence | TYPICAL KEYWAY AND BENCHING DETAIL<br>VALLEJO PROPERTIES - VISTA COVE<br>VALLEJO, CALIFORNIA | PROJECT NO.: 20164.000.001<br>SCALE: NO SCALE<br>DRAWN BY: CC CHECKED BY: AHF | FIGURE NO.<br>7 |
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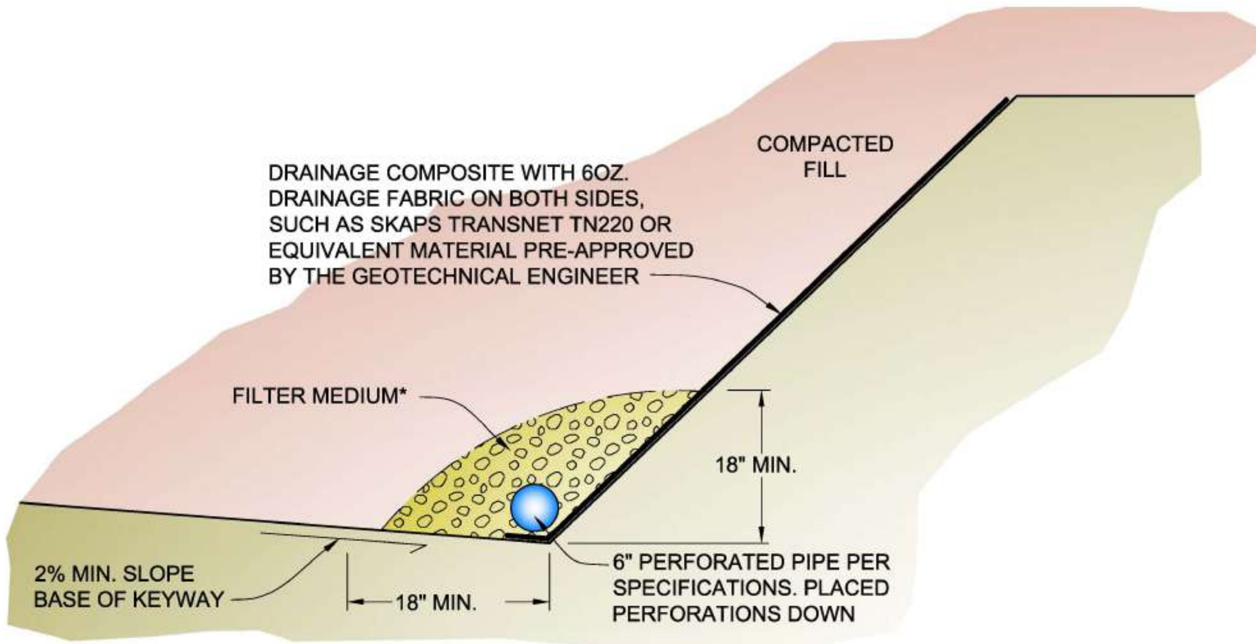
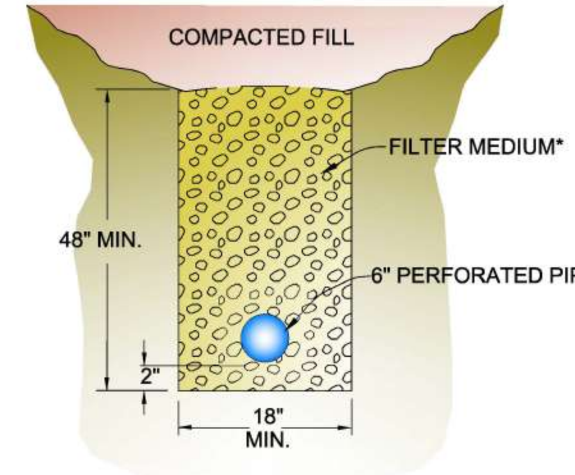
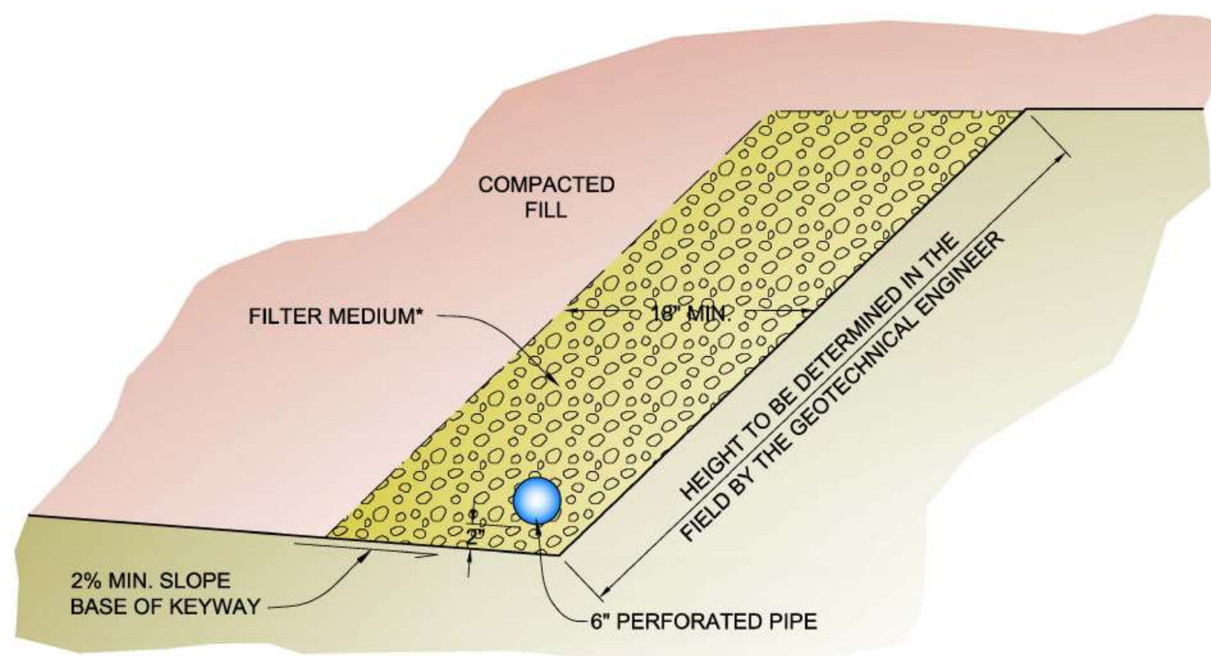



KEYWAY SUBDRAIN - OPTION 1




SWALE SUBDRAIN




KEYWAY SUBDRAIN - OPTION 2

## *FILTER MEDIUM

ALTERNATIVE A

### CLASS 2 PERMEABLE MATERIAL

MATERIAL SHALL CONSIST OF CLEAN, COARSE SAND AND GRAVEL OR CRUSHED STONE, CONFORMING TO THE FOLLOWING GRADING REQUIREMENTS:

| SIEVE SIZE | % PASSING SIEVE |
|---|---|
| 1" | 100 |
| 3/4" | 90-100 |
| 3/8" | 40-100 |
| #4 | 25-40 |
| #8 | 18-33 |
| #30 | 5-15 |
| #50 | 0-7 |
| #200 | 0-3 |

ALTERNATIVE B

### CLEAN CRUSHED ROCK OR GRAVEL WRAPPED IN FILTER FABRIC

ALL FILTER FABRIC SHALL MEET THE FOLLOWING MINIMUM AVERAGE ROLL VALUES UNLESS OTHERWISE SPECIFIED BY ENGEO:

| | |
|---|---|
| GRAB STRENGTH (ASTM D-4632) | 180 lbs |
| MASS PER UNIT AREA (ASTM D-4751) | 6 oz/yd $^2$ |
| APPARENT OPENING SIZE (ASTM D-4751) | 70-100 U.S. STD. SIEVE |
| FLOW RATE (ASTM D-4491) | 80 gal/min/ft |
| PUNCTURE STRENGTH (ASTM D-4833) | 80 lbs |

NOTES:

1. ALL PIPE JOINTS SHALL BE GLUED
2. ALL PERFORATED PIPE PLACED PERFORATIONS DOWN
3. 1% FALL (MINIMUM) ON ALL TRENCHES AND DRAIN LINES

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SUBDRAIN DETAILS
VALLEJO PROPERTIES - VISTA COVE
VALLEJO, CALIFORNIA

| | |
|---|---|
| PROJECT NO.: 20164.000.001 | FIGURE NO. 8 |
| SCALE: NO SCALE | |
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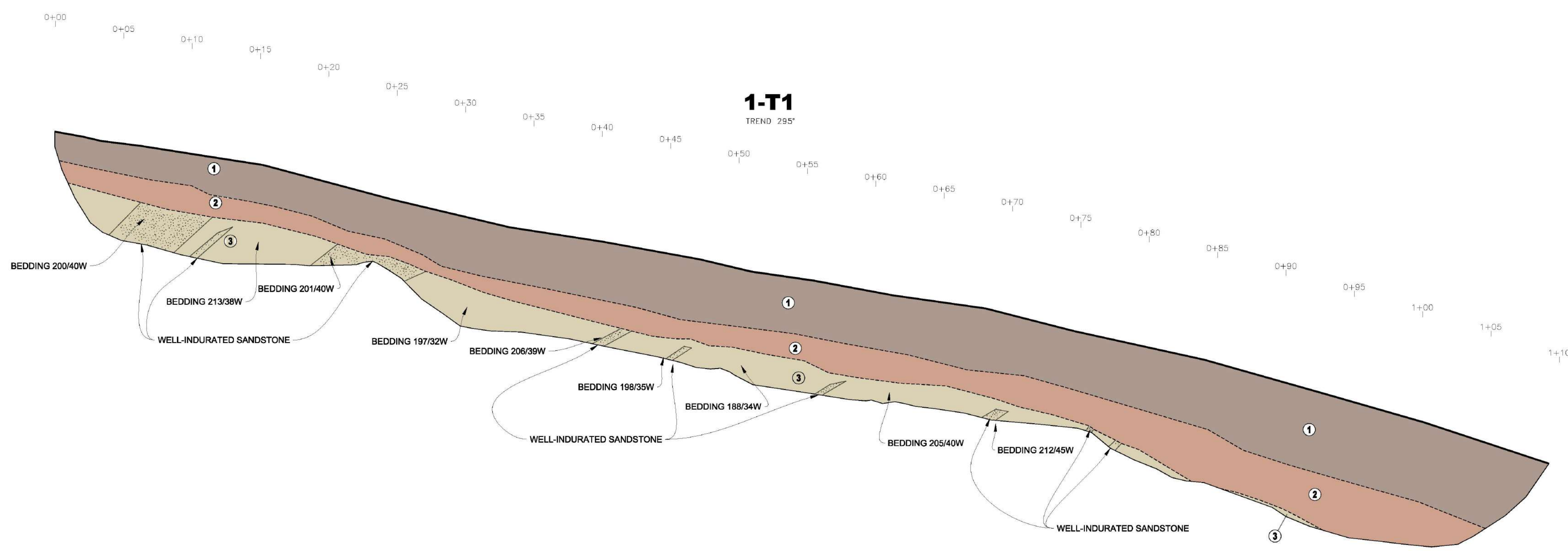
ORIGINAL FIGURE PRINTED IN COLOR

# 1-T1

TREND 295°

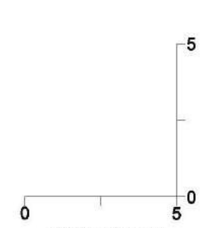



## 1-T1 EXPLANATION

1. CLAY, dark brown, stiff, dry, blocky pedogenic structure, organic material and roots present at surface thinning out with depth (COLLUVIUM)

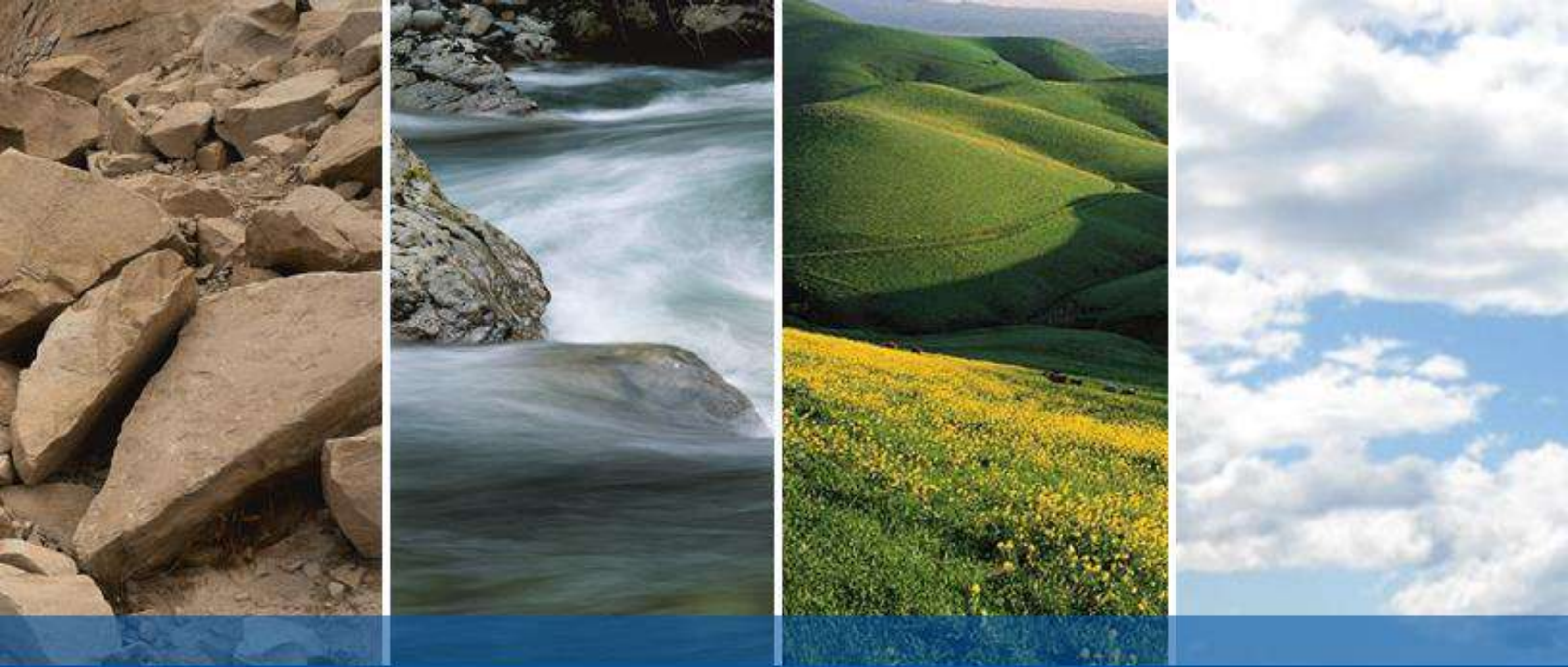
2. CLAY, brown to light reddish brown,stiff, moist, blocky pedogenic structures, very thin rootlets, grades to residual soils in areas of weak claystone, gradational contact with underlying bedrock (COLLUVIUM).

3. SANDSTONE interbedded with CLAYSTONE, light brown to grayish brown, fine-grained sandstone, moderately to well indurated interbedded with grey to greyish brown claystone, highly fractured, weak, with FeO staining, moderately to completely weathered (PANOCHE FORMATION)




| | | | |
|---|---|---|---|
| ENGEO Expect Excellence | TRENCH LOG 1-T1<br>VALLEJO PROPERTIES - VISTA COVE<br>VALLEJO, CALIFORNIA | PROJECT NO.: 20164.000.001<br>SCALE: AS SHOWN<br>DRAWN BY: CC CHECKED BY: AHF | FIGURE NO. 9 |

ORIGINAL FIGURE PRINTED IN COLOR



# APPENDIX A

## EXPLORATION LOGS
## TEST PIT LOGS

# CORELOG 1-B1

ENGEO
Expect Excellence

LATITUDE: 38.081594 LONGITUDE: -122.200269

Prelim. Geotechnical Exploration
Vista Cove
Vallejo, CA
20164.000.001

DATE DRILLED: 8/4/2022
HOLE DEPTH: Approx. 50 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (WGS84): Approx. 79 ft.

LOGGED / REVIEWED BY: K. Krisan / JSW
CORING CONTRACTOR: Britton Exploration
CORING METHOD, DRILL BIT SIZE/TYPE: Dry Core, HSA
NO. OF CORE BOXES: 4

| Run Number | Drill Rate (s/ft) | Run Length (ft) / Recovery (ft) | RQD | Relative Hardness (R0 R1 R2 R3 R4 R5 R6) / Weathering Grade (RS WC WH WM WS F) | Depth in Feet | Elevation in Feet | Graphic Log | DESCRIPTION | Discontinuities Remarks | Sample Type | In-Situ Testing | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 24 | | Drilling starts at 0.5 feet below ground surface | | | | |
| 1 | | 4.5/5 (90%) | N/A | | | | | FAT CLAY (CH), dark brown to yellowish brown, very stiff, moist, high plasticity, contains <5% fine sand [Qc] | | | | |
| | | | | | | 23 | | MUDSTONE, yellowish brown, extremely weak (R0), crushed to moderately fractured, massive, residual soil (RS) | | | | |
| | | | | | | | | Very weak (R1) to weak (R2), highly weathered (WH) | | | | |
| | | | | | 5 | | | | - Jo: 40° Pl, Cl | | | |
| 2 | | 4.5/4.5 (100%) | N/A | | | | | Yellowish brown to olive gray, MnO staining | - Jo: 64° | | | |
| | | | | | | 22 | | | - Jo: 10° | | | |
| | | | | | | | | Strong (R4), highly weathered (WH) | | | | |
| 3 | | 4/5 (80%) | N/A | | 10 | 21 | | MUDSTONE, yellowish brown, very weak (R1) to weak (R2), crushed to moderately fractured, massive, highly weathered (WH)<br>Strong (R4), contains carbonates | | | | |
| | | | | | | | | Moderately strong (R3), very closely fractured | - Sh: 24°, Fi, S, Ca | | | |
| | | | | | | 20 | | | - Be: 70°, Ti, U | | | |
| | | | | | | | NR | | | | | |
| 4 | | 2.5/5 (50%) | N/A | | 15 | | | Laminated bedding with interbedded dark gray to yellowish brown beds, contains shell fragments | - Be: 25° | | | |
| | | | | | | 19 | | Contains sandstone fragments, FeO staining | | | | |
| | | | | | | | NR | | | | | |
| | | | | | 20 | 18 | | | | | | |

LOG-CORELOG_MASTER CORE LOG ATTEMPT 2.GPJ ENGEO INC.GDT 9/8/22

ENGEO
Expect Excellence

# CORELOG 1-B1

LATITUDE: 38.081594 LONGITUDE: -122.200269

Prelim. Geotechnical Exploration
Vista Cove
Vallejo, CA
20164.000.001

| | | | |
|---|---|---|---|
| DATE DRILLED: | 8/4/2022 | LOGGED / REVIEWED BY: | K. Krisan / JSW |
| HOLE DEPTH: | Approx. 50 ft. | CORING CONTRACTOR: | Britton Exploration |
| HOLE DIAMETER: | 6.0 in. | CORING METHOD, DRILL BIT SIZE/TYPE: | Dry Core, HSA |
| SURF ELEV (WGS84): | Approx. 79 ft. | NO. OF CORE BOXES: | 4 |

| Run Number | Drill Rate (s/ft) | Run Length (ft) / Recovery (ft) | RQD | Depth in Feet |
|---|---|---|---|---|
| 5 | | 5/5 (100%) | N/A | 25–30 |
| 6 | | 5/5 (100%) | N/A | 30–35 |
| 7 | | 5/5 (100%) | N/A | 35–40 |

Relative Hardness: R0 R1 R2 R3 R4 R5 R6
Weathering Grade: RS WC WH WM WS F

Elevation in Feet: 17, 16, 15, 14, 13, 12

| DESCRIPTION | Discontinuities Remarks |
|---|---|
| MUDSTONE, yellowish brown, moderately strong (R3) to strong (R4), massive, slightly weathered (WS)<br>Very hard drilling 20 to 25 ft, straight drilled to 25 ft | - SPT Sample: 50 blows for 2" |
| MUDSTONE, olive gray to yellowish brown, very weak (R1) to weak (R2), crushed to moderately fractured, very thin bedding, highly weathered (WH) | - SPT Sample: 50 blows for 5" |
| SHALE, olive gray, extremely weak (R0) to weak (R2), crushed to moderately fractured, massive, highly weathered (WH) to completely weathered (WC) | - Jo: 43°, Ti, Pl, S<br>-<br>- Jo: 36°, Ti, Pl, S<br>- Be: 34° |
| Laminated bedding and fractures along bedding plane | - Jo: 42°, Cl<br>-<br>- Sh: 90°<br>- Be: 74° |
| MUDSTONE, bluish gray, very weak (R1) to weak (R2), crushed to widely fractured, massive, moderately weathered (WM) | -<br>- Be: 10°<br>- Sh: 70°, Ti, U, P |

Sample Type | In-Situ Testing | Notes

# CORELOG 1-B1

ENGEO
Expect Excellence

LATITUDE: 38.081594 LONGITUDE: -122.200269

Prelim. Geotechnical Exploration
Vista Cove
Vallejo, CA
20164.000.001

DATE DRILLED: 8/4/2022
HOLE DEPTH: Approx. 50 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (WGS84): Approx. 79 ft.

LOGGED / REVIEWED BY: K. Krisan / JSW
CORING CONTRACTOR: Britton Exploration
CORING METHOD, DRILL BIT SIZE/TYPE: Dry Core, HSA
NO. OF CORE BOXES: 4

| Run Number | Drill Rate (s/ft) | Run Length (ft) / Recovery (ft) | RQD | Relative Hardness (R0 R1 R2 R3 R4 R5 R6) / Weathering Grade (RS WC WH WM WS F) | Depth in Feet | Elevation in Feet | Graphic Log | DESCRIPTION | Discontinuities Remarks | Sample Type | In-Situ Testing | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | | 5/5 (100%) | N/A | | | 11 | | MUDSTONE, bluish gray, very weak (R1) to weak (R2), crushed to widely fractured, massive, moderately weathered (WM)<br>Carbonate infill between fractures<br>Flakes of pyrite | - Sh: 40°, Ti, U, P<br>-<br>- Sh: 80°, Ti, Pl, S | | | |
| 9 | | 5/5 (100%) | N/A | | 45 | 10<br>9 | | | - Jo: 40°<br>-<br>- Jo: 38°<br>- Sh: 75°, Pl, P | | | |
| | | | | | 50 | | | Bottom of boring at approximately 50 feet below ground surface. Ground water was not observed. | | | | |

R0 R1 R2 R3 R4 R5 R6
RS WC WH WM WS F

ENGEO
Expect Excellence

# CORELOG 1-B2

LATITUDE: 38.082062 LONGITUDE: -122.201254

Prelim. Geotechnical Exploration
Vista Cove
Vallejo, CA
20164.000.001

DATE DRILLED: 8/5/2022
HOLE DEPTH: Approx. 45 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (WGS84): Approx. 132 ft.

LOGGED / REVIEWED BY: N. Inserra / JSW
CORING CONTRACTOR: Britton Exploration
CORING METHOD, DRILL BIT SIZE/TYPE: Dry Core, HSA
NO. OF CORE BOXES: 3

| Run Number | Drill Rate (s/ft) | Run Length (ft) / Recovery (ft) | RQD | Relative Hardness (R0 R1 R2 R3 R4 R5 R6) / Weathering Grade (RS WC WH WM WS F) | Depth in Feet | Elevation in Feet | Graphic Log | DESCRIPTION | Discontinuities Remarks | Sample Type | In-Situ Testing | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 3/5 (60%) | N/A | | | 40, 39 | N/R | FAT CLAY (CH), reddish brown, very stiff, moist, high plasticity, contains <5% fine rounded gravel, carbonate, and charcoal [Qc] | - | | | |
| 2 | | 4/5 (80%) | N/A | | 5 | 38 | | MUDSTONE, dark brown, very weak (R1), crushed to closely fractured, massive, highly weathered (WH) | - Sh: 50°, Ti, Pl, U<br>-<br>- Sh: 50°, Ti, Pl, U<br>- Sh: 52°, Ti, Pl, U<br>- Sh: 44°, Pl | | | |
| 3 | | 1.8/5 (36%) | N/A | | 10 | 37, 36 | N/R | Very hard drilling<br>MUDSTONE, dark brown, very weak (R1), crushed to closely fractured, massive, highly weathered (WH) | -<br>- Jo: 44°, Pl | | | |
| 4 | | 0.5/5 (10%) | N/A | | 15, 20 | 35 | N/R | SANDSTONE, light to dark gray, strong (R4), massive, slightly weathered (WS), Mechanically crushed.<br>Very hard drilling from 15 to 20 feet | - | | | |

R0 R1 R2 R3 R4 R5 R6
RS WC WH WM WS F

LOG-CORELOG_MASTER CORE LOG ATTEMPT 2.GPJ ENGEO INC.GDT 9/7/22

# CORELOG 1-B2

LATITUDE: 38.082062 LONGITUDE: -122.201254

ENGEO Expect Excellence

Prelim. Geotechnical Exploration
Vista Cove
Vallejo, CA
20164.000.001

DATE DRILLED: 8/5/2022
HOLE DEPTH: Approx. 45 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (WGS84): Approx. 132 ft.

LOGGED / REVIEWED BY: N. Inserra / JSW
CORING CONTRACTOR: Britton Exploration
CORING METHOD, DRILL BIT SIZE/TYPE: Dry Core, HSA
NO. OF CORE BOXES: 3

| Run Number | Drill Rate (s/ft) | Run Length (ft) / Recovery (ft) | RQD |
|---|---|---|---|
| 5 | | 2.5/4.5 (56%) | N/A |
| 6 | | 5/5 (100%) | N/A |
| 7 | | 3.2/5 (64%) | N/A |
| 8 | | /0 (%) 4.4/5 (88%) /0 (%) | N/A |

Relative Hardness: R0 R1 R2 R3 R4 R5 R6
Weathering Grade: RS WC WH WM WS F

Depth in Feet: 25, 30, 35, 40
Elevation in Feet: 34, 33, 32, 31, 30, 29

Graphic Log


| DESCRIPTION | Discontinuities Remarks |
|---|---|
| SANDSTONE, dark brown, strong (R4), massive, moderately weathered (WM)<br>Very hard drilling from 20 to 22 1/2 feet | - SPT Sample: 50 blows for 4" |
| MUDSTONE, light gray to gray, strong (R4), closely fractured, massive, highly weathered (WH) | - |
| Residual soil (RS), Section of residual soil mudstone | |
| SHALE, brown, weak (R2) to very weak (R1), very thin bedding, moderately weathered (WM), Interbedded siltstone, brown to gray, with thinly interbedded mudstone | - Be: 10°<br>- Jo: 47° |
| MUDSTONE, brown, moderately strong (R3), massive, highly weathered (WH) | -<br>- Be: 10°<br>- Sh: 60°, Pl |
| Very hard drilling | |
| SANDSTONE, yellowish red, moderately strong (R3) to strong (R4), very closely fractured to crushed, very thin bedding, highly weathered (WH) to moderately weathered (WM), fractured along bedding | - |
| MUDSTONE, light gray, weak (R2), massive, completely weathered (WC) | |
| SHALE, brown, moderately strong (R3), closely fractured, massive, slightly weathered (WS) | - Jo: 45°, Ti |
| SANDSTONE, dark gray to dark brown, strong (R4), crushed, massive, moderately weathered (WM) | - Jo: 40°<br>- |
| MUDSTONE, light gray, moderately strong (R3) to strong (R4), crushed to closely fractured, very thin bedding, moderately weathered (WM) to slightly weathered (WS) | - Jo: 80°, Cl |

Sample Type | In-Situ Testing | Notes

# CORELOG 1-B2

ENGEO
Expect Excellence

LATITUDE: 38.082062 LONGITUDE: -122.201254

Prelim. Geotechnical Exploration
Vista Cove
Vallejo, CA
20164.000.001

DATE DRILLED: 8/5/2022
HOLE DEPTH: Approx. 45 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (WGS84): Approx. 132 ft.

LOGGED / REVIEWED BY: N. Inserra / JSW
CORING CONTRACTOR: Britton Exploration
CORING METHOD, DRILL BIT SIZE/TYPE: Dry Core, HSA
NO. OF CORE BOXES: 3

| Run Number | Drill Rate (s/ft) | Run Length (ft) / Recovery (ft) | RQD | Relative Hardness (R0 R1 R2 R3 R4 R5 R6) / Weathering Grade (RS WC WH WM WS F) | Depth in Feet | Elevation in Feet | Graphic Log | DESCRIPTION | Discontinuities Remarks | Sample Type | In-Situ Testing | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N/A | | | 28<br>27 | SPT<br>N/R | SANDSTONE, gray, strong (R4), massive, freshly weathered (F)<br>Straight drilled through hard bedrock to 45 feet | - SPT Sample: 50 blows for 1"<br>- | | | |
| | | | | | 45 | | SPT | Bottom of boring at approximately 45 feet below ground surface. Ground water was not observed. | - SPT Sample: 50 blows for 1" | | | |

R0 R1 R2 R3 R4 R5 R6
RS WC WH WM WS F

LOG-CORELOG_MASTER CORE LOG ATTEMPT 2.GPJ ENGEO INC.GDT 9/7/22

| ENGEO Expect Excellence | TEST PIT LOG | |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-13-2022 | |
| **Test Pit Number** | **Depth (Feet)** | **Description** |
| 1-TP1 | 0 – 3½ | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc]<br><br>PP: 4.0 |
| | 3½ – 7½ | INTERBEDDED SANDSTONE AND SILTSTONE, brown to dark yellowish brown, weak, moderately to highly weathered, thinly bedded, closely to very closely fractured, predominantly sandstone [Kp]<br><br>Bedrock measurements:<br>N40E at 42°W (west end)<br>N45E at 49°W (east end)<br><br>Joint N72W at 58°S |

# TEST PIT LOG

| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-13-2022 |
|---|---|

| Test Pit Number | Depth (Feet) | Description |
|---|---|---|
| 1-TP2 | 0 – 4 | SANDY LEAN CLAY (CL), dark brown, stiff, moist, dark gray mottled pedogenic texture, contains gravel [Qc]<br>PP: 3.0 |
| | 4 – 8 | LEAN CLAY WITH SAND (CL), very dark brown, stiff, moist, blocky pedogenic texture, Mn nodules, fine sand, contains fine gravel [Qc]<br>PP: 3.5 |
| | 8 – 9 | CLAYEY GRAVEL (GC), dark yellowish brown, very dense, moist, gravel is bedrock fragments [Kp Residual Soil] |
| | 9 – 10 | SILTSTONE/ MUDSTONE, dark gray, weak, highly weathered, very closely fractured, weathers dark yellowish brown [Kp] |

| ENGEO Expect Excellence | | TEST PIT LOG |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-13-2022 |
| Test Pit Number | Depth (Feet) | Description |
| 1-TP3 | 0 – 8 | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc]<br><br>Increasing sand at 3 feet. |
| | 8 – 10 | CLAYEY GRAVEL (GC), dark yellowish brown, very dense, moist, gravel is bedrock fragments [Kp Residual Soil] |
| | 10 – 11 | CLAYSTONE, dark olive brown to olive gray, very weak, highly weathered, thinly bedded, very closely fractured, Mn infill along fractures [Kp] |

# TEST PIT LOG

| Vista Cove<br>Vallejo, CA<br>20164.000.001 | | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-13-2022 |
|---|---|---|
| Test Pit Number | Depth (Feet) | Description |
| 1-TP4 | 0 – 3 | LEAN CLAY WITH SAND (CL), very dark brown mottled with dark grayish brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 3 – 8 | INTERBEDDED SANDSTONE AND SILTSTONE/ MUDSTONE, brown to dark yellowish brown, weak to very weak, highly weathered, thinly bedded to laminated, very closely fractured [Kp]<br><br>Bedding Measurements:<br>N65E at 48°W |

| | TEST PIT LOG | |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-13-2022 | |

| Test Pit Number | Depth (Feet) | Description |
|---|---|---|
| 1-TP5 | 0 – 3 | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 3 – 4 | CLAYEY GRAVEL (GC), dark yellowish brown, very dense, moist, gravel is bedrock fragments [Kp Residual Soil] |
| | 4 – 8 | INTERBEDDED MUDSTONE AND SANDSTONE, very dark brown to dark grayish brown, weak, thinly bedded, very closely fractured, Mn infill along fracture surfaces [Kp]<br><br>Bedding Measurement:<br>N51E at 36°W<br><br>Joint Measurement:<br>N40W at 77°S |

| ENGEO Expect Excellence | TEST PIT LOG | |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-13-2022 | |
| **Test Pit Number** | **Depth (Feet)** | **Description** |
| 1-TP6 | 0 – 3 | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 3 – 3½ | CLAYEY GRAVEL (GC), dark yellowish brown, very dense, moist, gravel is bedrock fragments [Kp Residual Soil] |
| | 3½ – 6 | INTERBEDDED MUDSTONE AND SANDSTONE, very dark brown to dark grayish brown, weak, thinly bedded, very closely fractured, Mn infill along fracture surfaces [Kp] |

| ENGEO Expect Excellence | TEST PIT LOG | |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-14-2022 | |

| Test Pit Number | Depth (Feet) | Description |
|---|---|---|
| 1-TP7 | 0 – 9 | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 9 – 11 | CLAYSTONE, dark olive brown to olive gray, very weak, heavily weathered, thinly bedded, very closely fractured, Mn infill along fractures [Kp] |

<table>
<tr><td colspan="2">ENGEO<br>Expect Excellence</td><td>TEST PIT LOG</td></tr>
<tr><td colspan="2">Vista Cove<br>Vallejo, CA<br>20164.000.001</td><td>Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-14-2022</td></tr>
<tr><td>Test Pit Number</td><td>Depth (Feet)</td><td>Description</td></tr>
<tr><td>1-TP8</td><td>0 – 2½</td><td>SANDY LEAN CLAY (CL), dark brown, hard, moist, dark gray mottled pedogenic texture, contains gravel [Qc]<br>PP: > 4.5</td></tr>
<tr><td></td><td>2½ – 6</td><td>SANDSTONE, brown, weak to moderately strong, moderately weathered, thinly bedded, indurated, closely fractured, some Fe staining along fractures [Kp]<br><br>Bedding Measurement:<br>N30E at 48°W</td></tr>
</table>

| ENGEO Expect Excellence | TEST PIT LOG | |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White<br>Logged Date: 7-14-2022 | |

| Test Pit Number | Depth (Feet) | Description |
|---|---|---|
| 1-TP9 | 0 – 2 | SANDY LEAN CLAY (CL), dark brown, hard, moist, dark gray mottled pedogenic texture, contains gravel [Qc] |
| | 2 – 4 | SILTSTONE, dark brownish gray to dark brown, very weak, highly weathered, very closely fractured, Fe staining along fractures [Kp]<br><br>Bedding measurement:<br>N28E at 42°W |

| ENGEO Expect Excellence | | TEST PIT LOG |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | | Logged By: Jacob White<br>Logged Date: 7-14-2022 |
| Test Pit Number | Depth (Feet) | Description |
| 1-TP10 | 0 – 5 | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 5 – 6 | CLAYEY GRAVEL (GC), dark yellowish brown, very dense, moist, gravel is bedrock fragments [Kp Residual Soil] |
| | 6 – 8 | INTERBEDDED MUDSTONE AND SANDSTONE, very dark brown to dark grayish brown, weak to moderately strong, thinly bedded, very closely fractured [Kp] |

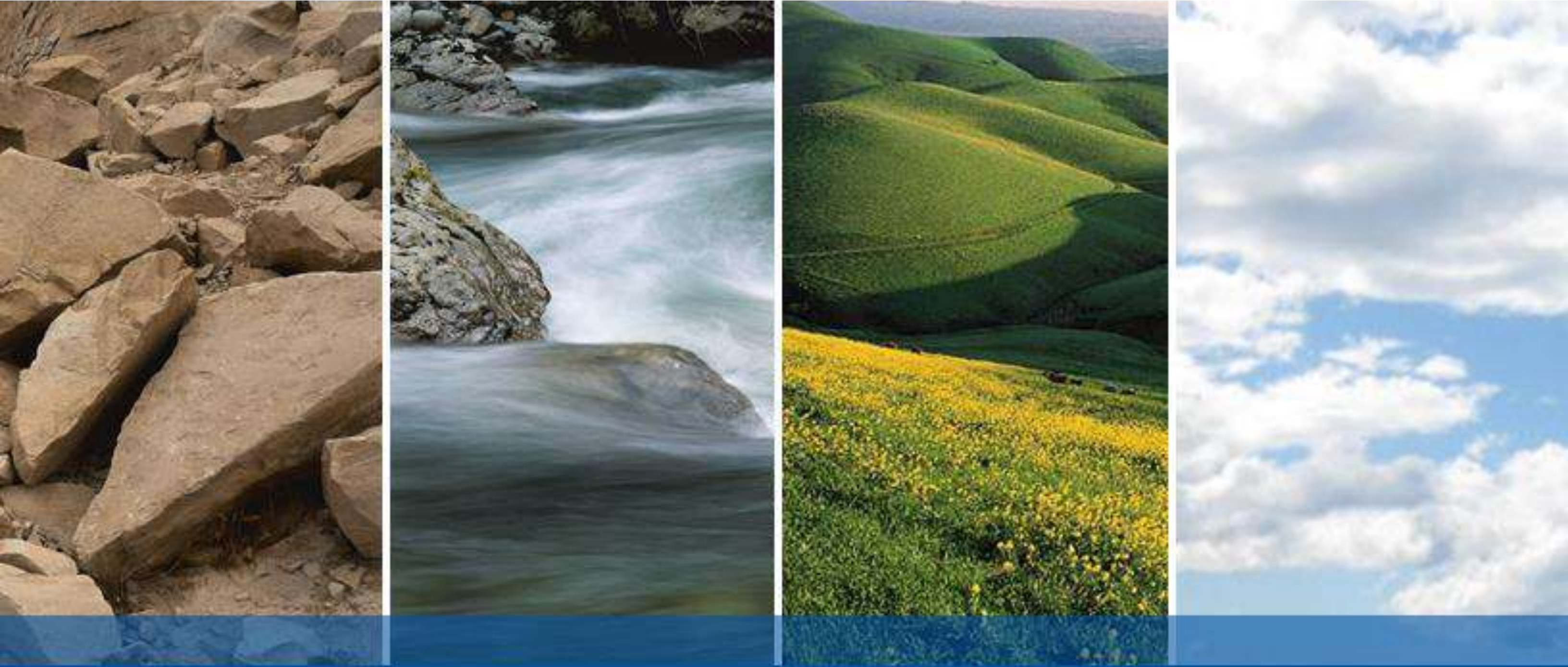
| ENGEO Expect Excellence | TEST PIT LOG | |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-14-2022 | |
| Test Pit Number | Depth (Feet) | Description |
| 1-TP11 | 0 – 6 | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 6 – 7 | CLAYEY GRAVEL (GC), dark yellowish brown, very dense, moist, gravel is bedrock fragments [Kp Residual Soil] |
| | 7 – 8 | INTERBEDDED MUDSTONE AND SANDSTONE, very dark brown to dark grayish brown, weak to moderately strong, thinly bedded, very closely fractured [Kp] |

| ENGEO Expect Excellence | TEST PIT LOG | |
|---|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-14-2022 | |

| Test Pit Number | Depth (Feet) | Description |
|---|---|---|
| 1-TP12 | 0 – 4 | LEAN CLAY WITH SAND (CL), very dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 4 – 6 | INTERBEDDED MUDSTONE AND SANDSTONE, yellowish brown, weak, thinly bedded, very closely fractured, Mn infill along fracture surfaces [Kp]<br><br>Bedding Measurement:<br>N45E at 46°W |

| ENGEO Expect Excellence | TEST PIT LOG |
|---|---|
| Vista Cove<br>Vallejo, CA<br>20164.000.001 | Logged By: Jacob White/ Matt Farrell<br>Logged Date: 7-14-2022 |

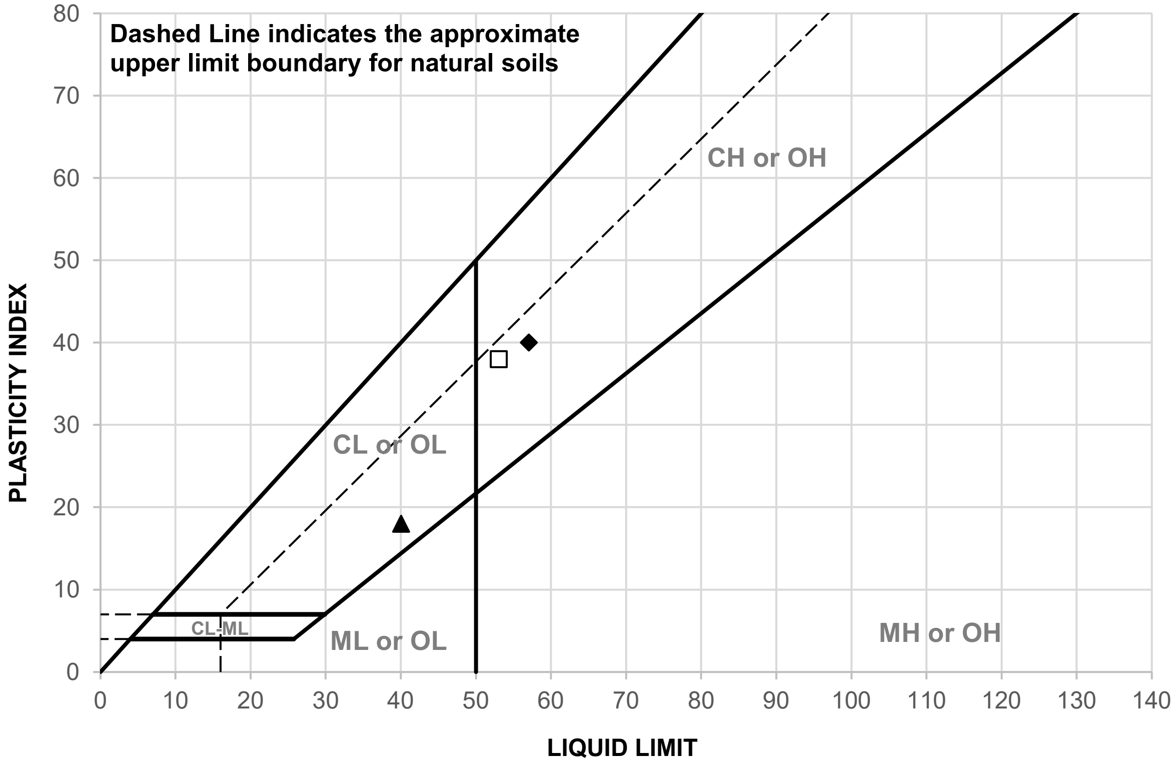
| Test Pit Number | Depth (Feet) | Description |
|---|---|---|
| 1-TP13 | 0 – 5 | LEAN CLAY WITH SAND (CL), light to dark brown, stiff to very stiff, moist, blocky pedogenic texture, translocated clay films, contains sandstone gravels [Qc] |
| | 5 – 7 | INTERBEDDED SANDSTONE AND SILTSTONE, brown to dark yellowish brown, weak to very weak, highly weathered, thinly bedded, very closely fractured [Kp]<br><br>Bedding Measurement:<br>N25E at 37°W |



# APPENDIX B

## LABORATORY TEST DATA BY ENGEO

# LIQUID AND PLASTIC LIMITS TEST REPORT
## ASTM D4318




| | SAMPLE ID | DEPTH (ft) | MATERIAL DESCRIPTION | LL | PL | PI |
|---|---|---|---|---|---|---|
| ▲ | 1-B1@13 | 13 | See exploration logs | 40 | 22 | 18 |
| ◆ | T-1@3.5 | 3.5 | See exploration logs | 57 | 17 | 40 |
| □ | T-1@5 | 5 | See exploration logs | 53 | 15 | 38 |

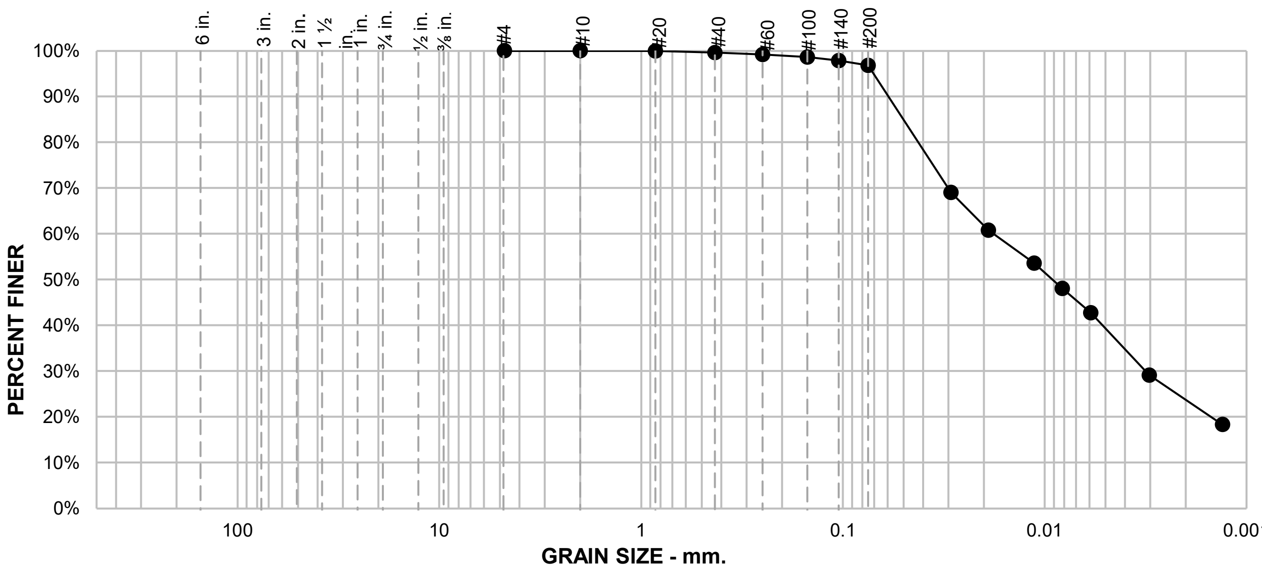
| | SAMPLE ID | TEST METHOD | REMARKS |
|---|---|---|---|
| ▲ | 1-B1@13 | PI: ASTM D4318, Wet Method | |
| ◆ | T-1@3.5 | PI: ASTM D4318, Wet Method | |
| □ | T-1@5 | PI: ASTM D4318, Wet Method | |

ENGEO
Expect Excellence

**CLIENT:** Sancerra
**PROJECT NAME:** Vallejo Properties - Glen Cove
**PROJECT NO:** 20164.000.001 PH001
**PROJECT LOCATION:** Vallejo, California
**REPORT DATE:** 9/8/2022
**TESTED BY:** G. Criste
**REVIEWED BY:** D. Seibold

# PARTICLE SIZE DISTRIBUTION REPORT

## ASTM D422




**SAMPLE ID:** 1-B1@13

**DEPTH (ft):** 13

| % +75mm | % GRAVEL | | % SAND | | | % FINES | |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | COARSE | MEDIUM | FINE | SILT | CLAY |
| | | | | 0.4 | 2.8 | 73.1 | 23.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.6 | | |
| #60 | 99.2 | | |
| #100 | 98.6 | | |
| #140 | 97.8 | | |
| #200 | 96.8 | | |
| 0.0292 mm. | 69.0 | | |
| 0.0190 mm. | 60.8 | | |
| 0.0113 mm. | 53.6 | | |
| 0.0082 mm. | 48.1 | | |
| 0.0059 mm. | 42.8 | | |
| 0.0030 mm. | 29.1 | | |
| 0.0013 mm. | 18.3 | | |

**SOIL DESCRIPTION**

See exploration logs

**ATTERBERG LIMITS**

PL = 22 LL = 40 PI = 18

**COEFFICIENTS**

| | | |
|---|---|---|
| $D_{90}$ = 0.0595 mm | $D_{85}$ = 0.0502 mm | $D_{60}$ = 0.0180 mm |
| $D_{50}$ = 0.0091 mm | $D_{30}$ = 0.0032 mm | $D_{15}$ = |
| $D_{10}$ = | $C_u$ = | $C_c$ = |

**CLASSIFICATION**

USCS = CL

**REMARKS**

Silt/clay division of 0.002mm used
PI: ASTM D4318, Wet Method
USCS: ASTM D2487

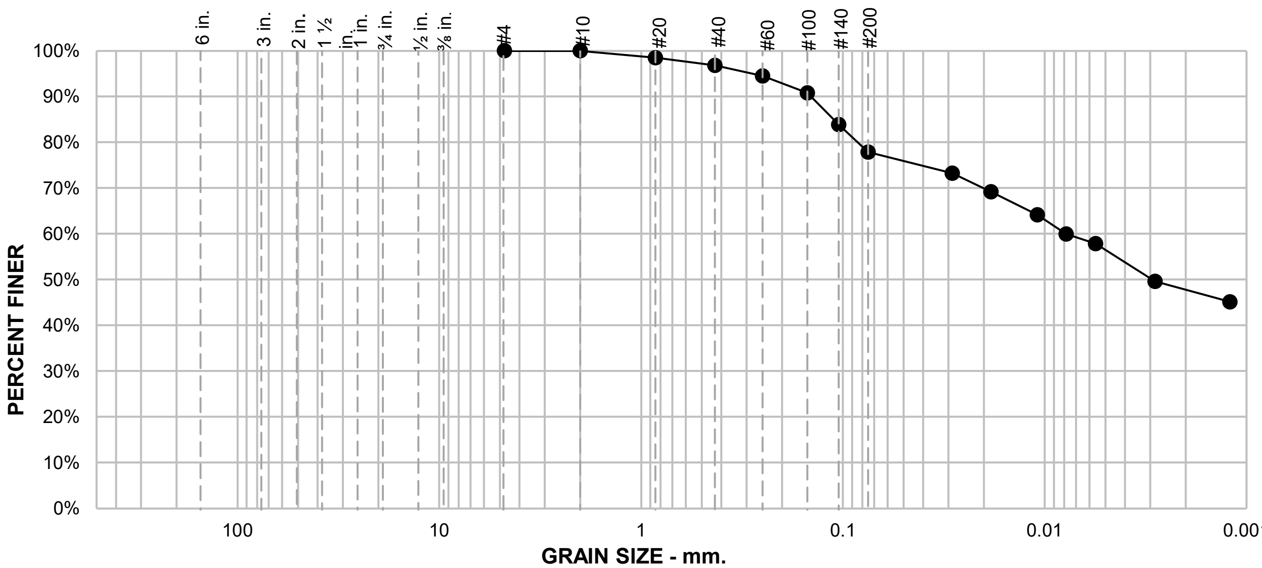
* (no specification provided)

**CLIENT:** Sancerra
**PROJECT NAME:** Vallejo Properties - Glen Cove
**PROJECT NO:** 20164.000.001 PH001
**PROJECT LOCATION:** Vallejo, California
**REPORT DATE:** 9/8/2022
**TESTED BY:** G. Criste
**REVIEWED BY:** D. Seibold

ENGEO — Expect Excellence

# PARTICLE SIZE DISTRIBUTION REPORT

## ASTM D422




**SAMPLE ID:** T-1@5

**DEPTH (ft):** 5

| % +75mm | % GRAVEL | | % SAND | | | % FINES | |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | COARSE | MEDIUM | FINE | SILT | CLAY |
| | | | | 3.2 | 19.0 | 30.0 | 47.8 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 98.5 | | |
| #40 | 96.8 | | |
| #60 | 94.5 | | |
| #100 | 90.8 | | |
| #140 | 83.9 | | |
| #200 | 77.8 | | |
| 0.0287 mm. | 73.2 | | |
| 0.0184 mm. | 69.2 | | |
| 0.0109 mm. | 64.1 | | |
| 0.0078 mm. | 59.9 | | |
| 0.0056 mm. | 57.8 | | |
| 0.0028 mm. | 49.6 | | |
| 0.0012 mm. | 45.1 | | |

**SOIL DESCRIPTION**

See exploration logs

**ATTERBERG LIMITS**

PL = 15 | LL = 53 | PI = 38

**COEFFICIENTS**

$D_{90}$ = 0.1439 mm | $D_{85}$ = 0.1111 mm | $D_{60}$ = 0.0079 mm

$D_{50}$ = 0.0029 mm | $D_{30}$ = | $D_{15}$ =

$D_{10}$ = | $C_u$ = | $C_c$ =

**CLASSIFICATION**

USCS = CH

**REMARKS**

Silt/clay division of 0.002mm used
PI: ASTM D4318, Wet Method
USCS: ASTM D2487

* (no specification provided)

ENGEO
Expect Excellence

**CLIENT:** Sancerra

**PROJECT NAME:** Vallejo Properties - Glen Cove

**PROJECT NO:** 20164.000.001 PH001

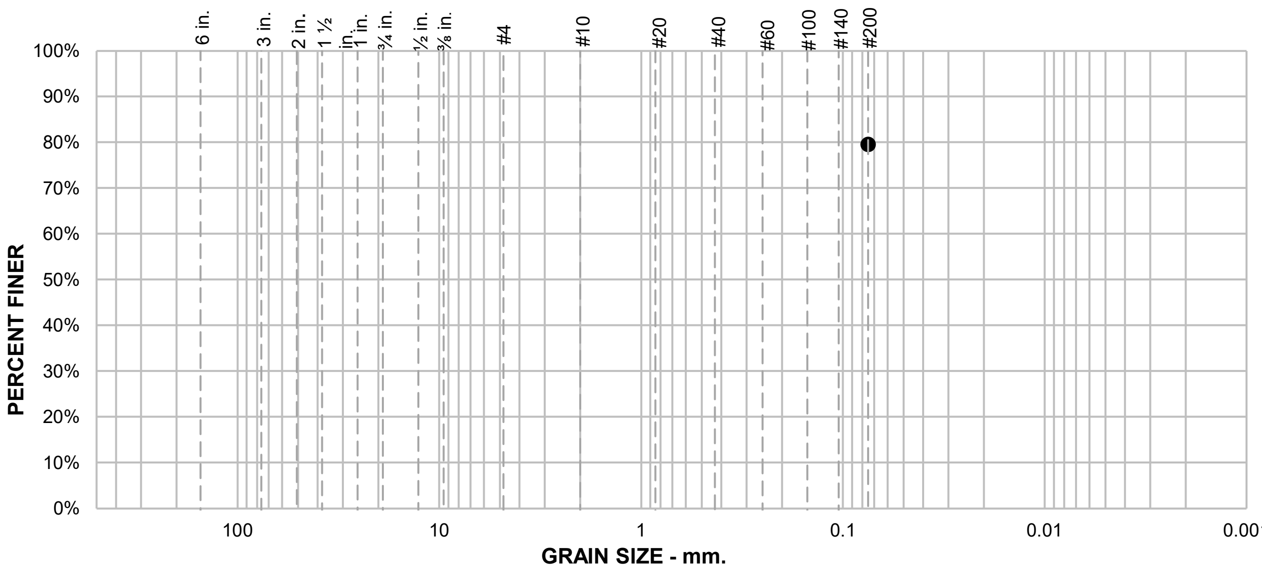
**PROJECT LOCATION:** Vallejo, California

**REPORT DATE:** 9/8/2022

**TESTED BY:** G. Criste

**REVIEWED BY:** D. Seibold

# PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140, Method B




**SAMPLE ID:** T-1@3.5
**DEPTH (ft):** 3.5

| % +75mm | % GRAVEL | | % SAND | | | % FINES | |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | COARSE | MEDIUM | FINE | SILT | CLAY |
| | | | | | | 20.4 | 79.6 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #200 | 79.6 | | |

* (no specification provided)

**SOIL DESCRIPTION**
See exploration logs

**ATTERBERG LIMITS**

PL = 17 LL = 57 PI = 40

**COEFFICIENTS**

$D_{90}$ = $D_{85}$ = $D_{60}$ =
$D_{50}$ = $D_{30}$ = $D_{15}$ =
$D_{10}$ = $C_u$ = $C_c$ =

**CLASSIFICATION**
USCS = CH

**REMARKS**
Silt/clay division of 0.002mm used
PI: ASTM D4318, Wet Method
USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 47.7 g

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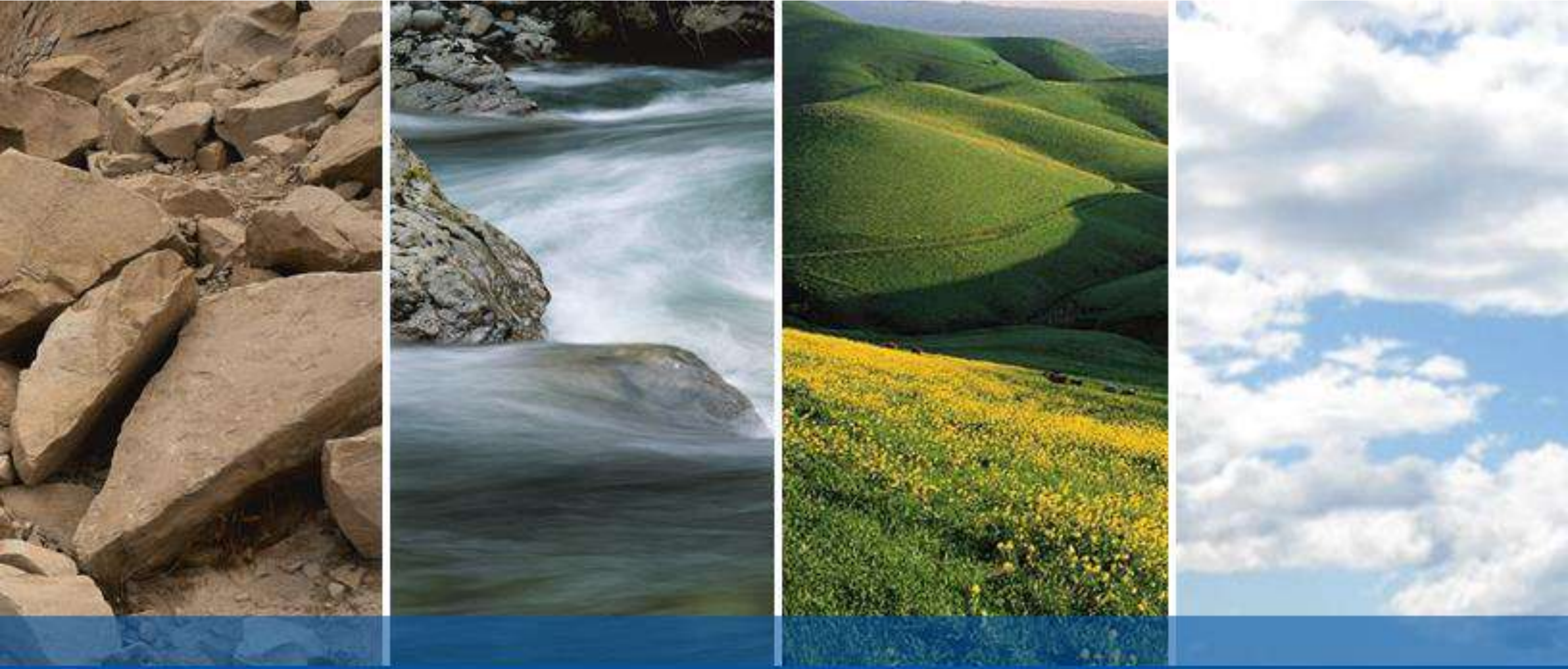
**CLIENT:** Sancerra
**PROJECT NAME:** Vallejo Properties - Glen Cove
**PROJECT NO:** 20164.000.001 PH001
**PROJECT LOCATION:** Vallejo, California
**REPORT DATE:** 9/8/2022
**TESTED BY:** G. Criste
**REVIEWED BY:** D. Seibold



# APPENDIX C

## LABORATORY TEST DATA BY CERCO

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: ENGEO, Incorporated
Client's Project No.: 20164.000.001
Client's Project Name: Vallejo
Date Sampled: 24-Aug-22
Date Received: 24-Aug-22
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 2-Sep-2022

| Job/Sample No. | Sample I.D. | Redox (mV) | pH | Conductivity (umhos/cm)* | Resistivity (100% Saturation) (ohms-cm) | Sulfide (mg/kg)* | Chloride (mg/kg)* | Sulfate (mg/kg)* |
|---|---|---|---|---|---|---|---|---|
| 2208043-001 | T-1 @ 7' | - | - | - | - | - | 110 | 92 |
| 2208043-002 | 1-B2 @ 10' | - | - | - | - | - | 92 | N.D. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Method: | ASTM D1498 | ASTM D4972 | ASTM D1125M | ASTM G57 | ASTM D4658M | ASTM D4327 | ASTM D4327 |
| Reporting Limit: | - | - | 10 | - | 50 | 15 | 15 |
| Date Analyzed: | - | - | - | - | - | 1-Sep-2022 | 1-Sep-2022 |

* Results Reported on "As Received" Basis

N.D. - None Detected

Sherri Moore for

Sherri Moore
Chemist

**Quality Control Summary - All laboratory quality control parameters were found to be within established limits**

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# MEMORANDUM

**Date:** March 26, 2025 **Job No.:** 24217-00

**To:** Florentina Craciun, LSA

**From:** Cem Atabek, Baseline Environmental Consulting

**Subject:** **Peer Review of Preliminary Geotechnical Exploration, Vista Cove Planned Development Project, Vallejo, California**

Baseline Environmental Consulting (Baseline) has performed a peer review of the Preliminary Geotechnical Exploration prepared by ENGEO and dated September 12, 2022, for the Vista Cove Planned Development Project (project) located on the property identified by Assessor's Parcel Numbers (APNs) 0079-171-170 and 0079-120-100 (project site). Baseline's peer review was performed to evaluate whether the Preliminary Geotechnical Exploration provides the necessary information to perform CEQA review for the project.

The Preliminary Geotechnical Exploration indicates that the main geotechnical and geologic concerns for the project include: 1) stability of graded slopes, 2) corrective grading for planned building sites, and 3) presence of moderate to highly expansive soil and bedrock. The Preliminary Geotechnical Exploration provides preliminary recommendations to address geotechnical and geologic concerns identified at the project site and indicates that a supplemental design-level geotechnical exploration should be performed to provide site-specific recommendations for site preparation, remedial and design grading, foundation design, site improvements, and drainage. In Baseline's opinion, the Preliminary Geotechnical Exploration provides the information necessary to perform CEQA review for the project.

The Preliminary Geotechnical Exploration indicates that corrective grading is anticipated to include construction of subsurface drainage facilities in engineered slopes, and all retaining walls should include subsurface drainage facilities to prevent the build-up of hydrostatic pressures behind the walls. The Preliminary Geotechnical Exploration also recommends that bioretention areas include a waterproof liner due to expansive soil conditions, or that alternatively if infiltration is desired, which would result in some risk of movement of adjacent improvements, the perimeter of the bioretention areas be lined with a tree root barrier that extends at least 1 foot below the bottom of the bioretention areas/infiltration trenches. Baseline recommends that the discharge of water from subsurface drainage features and the lining of bioretention areas be accounted for in the CEQA review of hydrology and water quality related impacts of the project.

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